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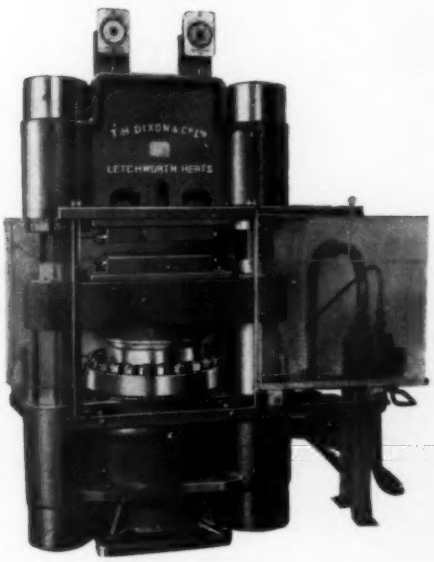

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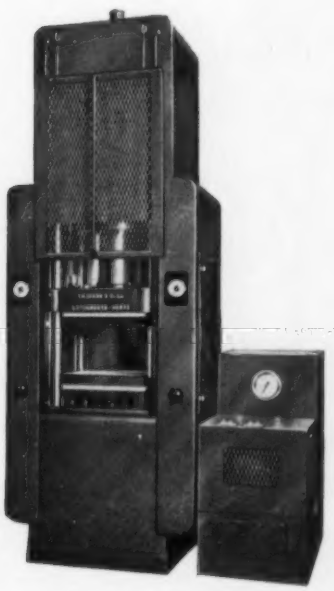

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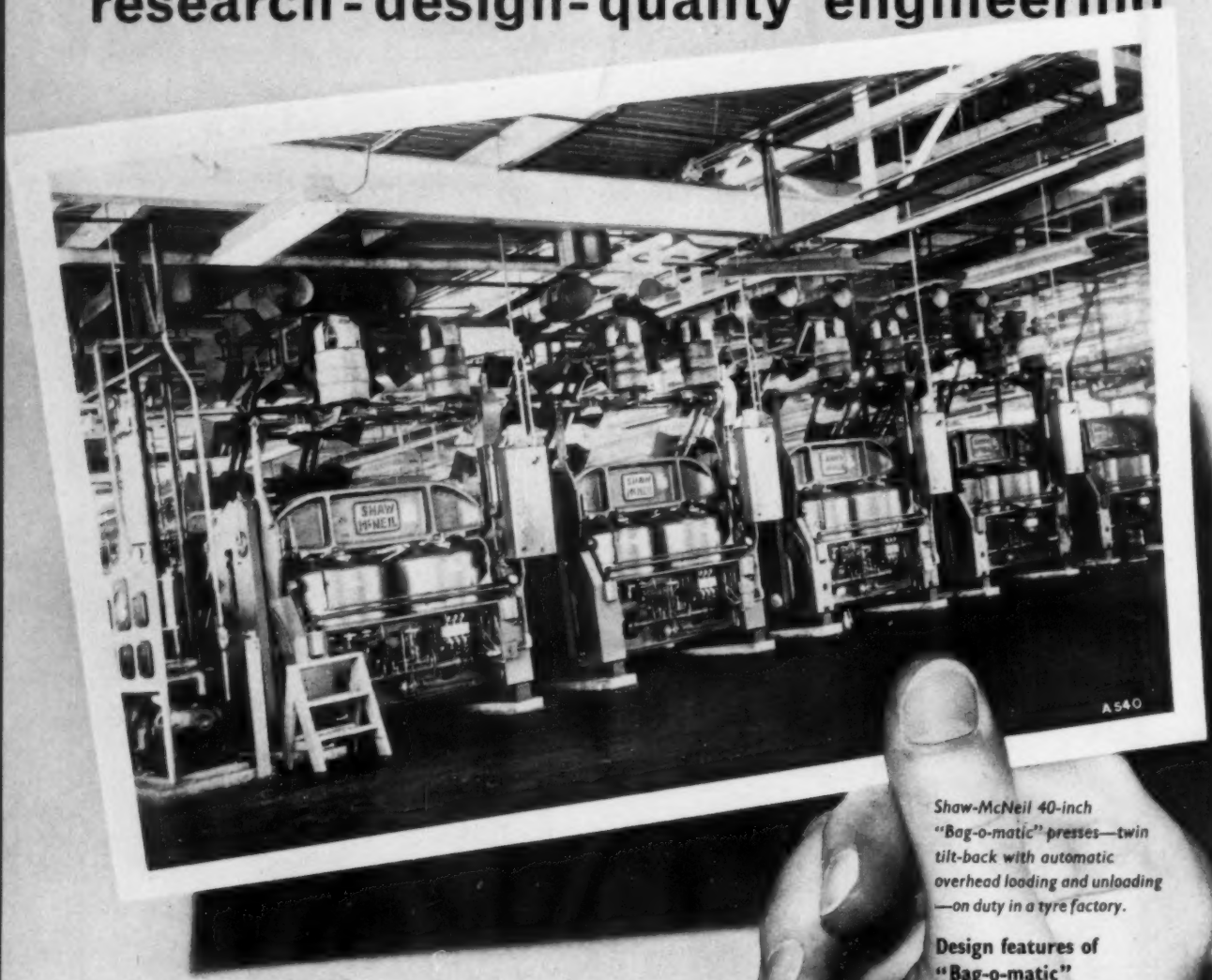

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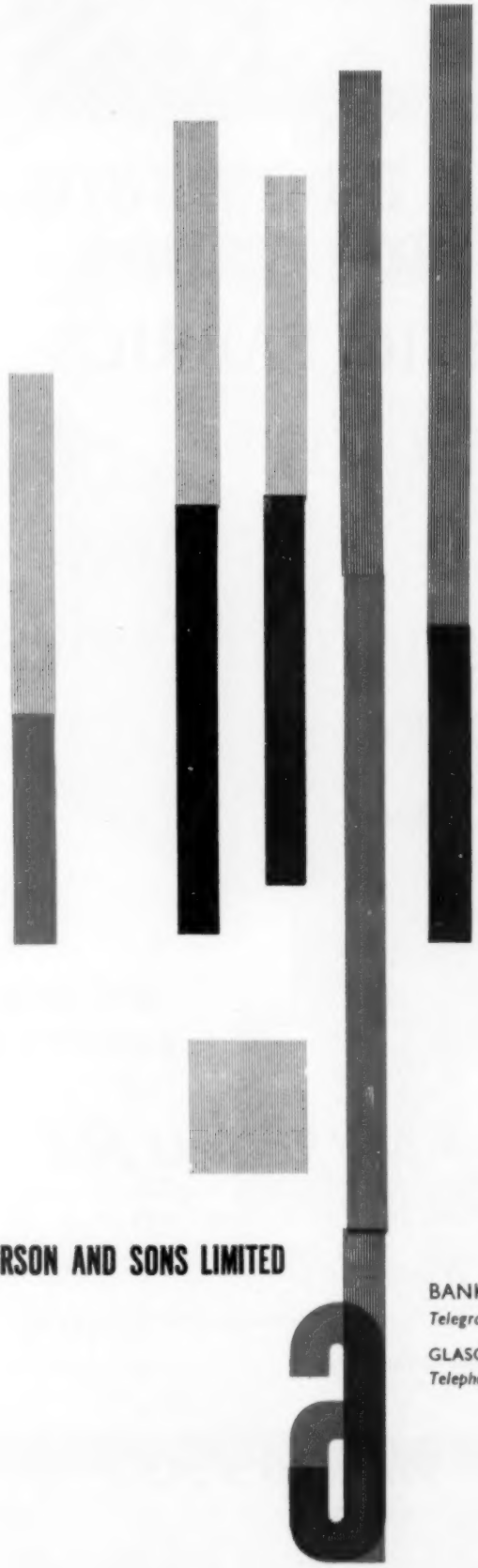

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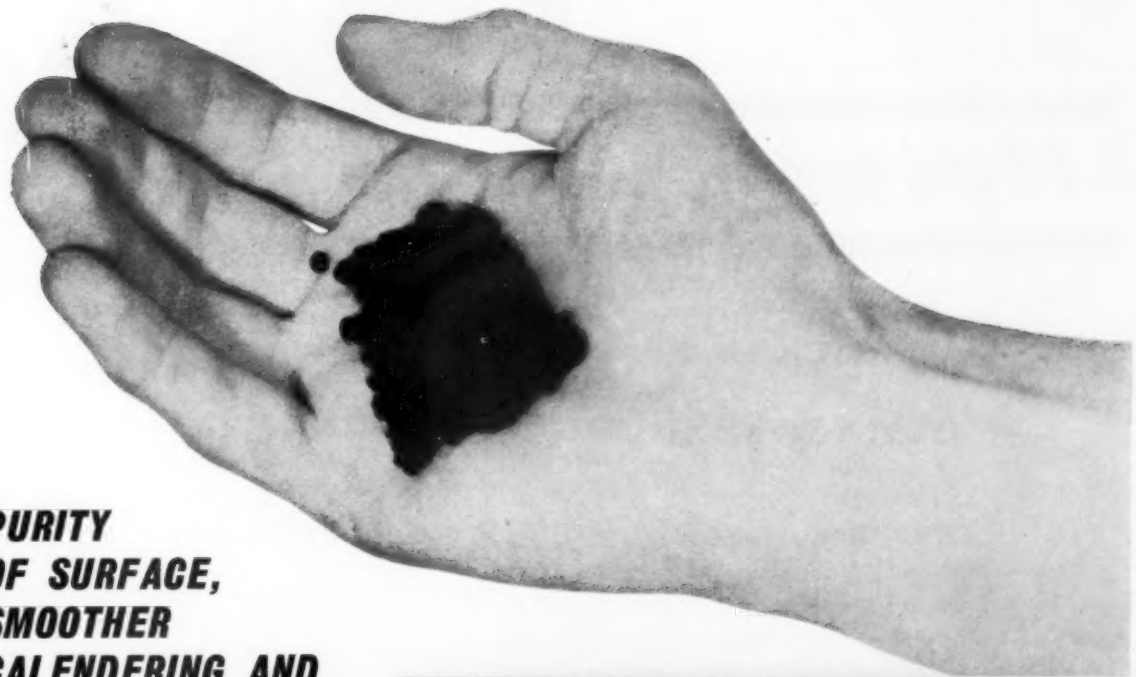

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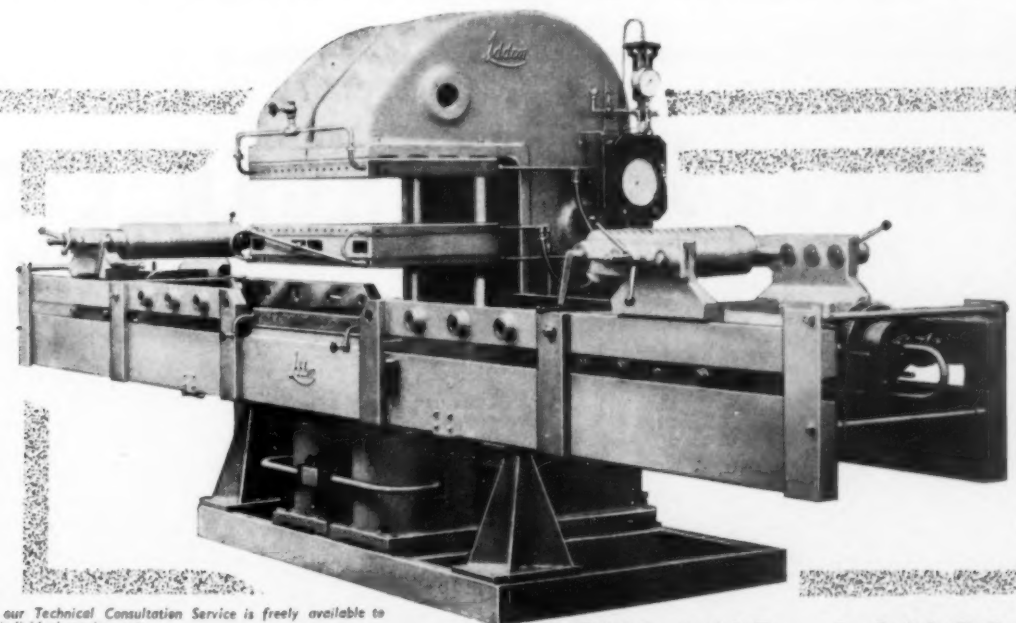

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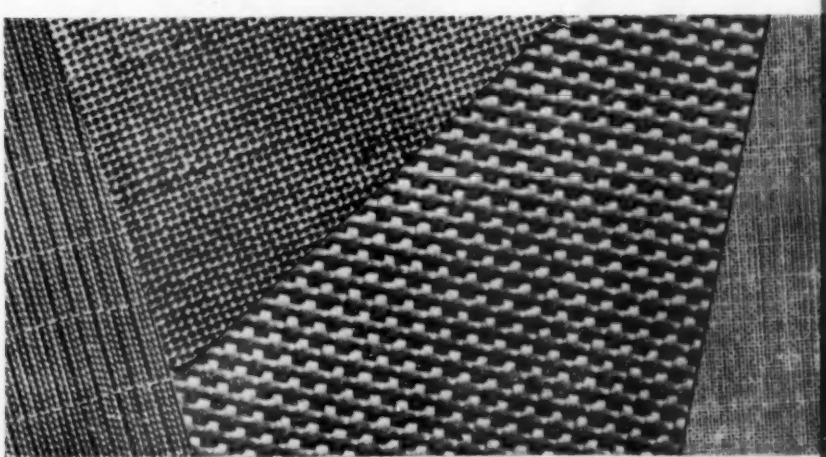

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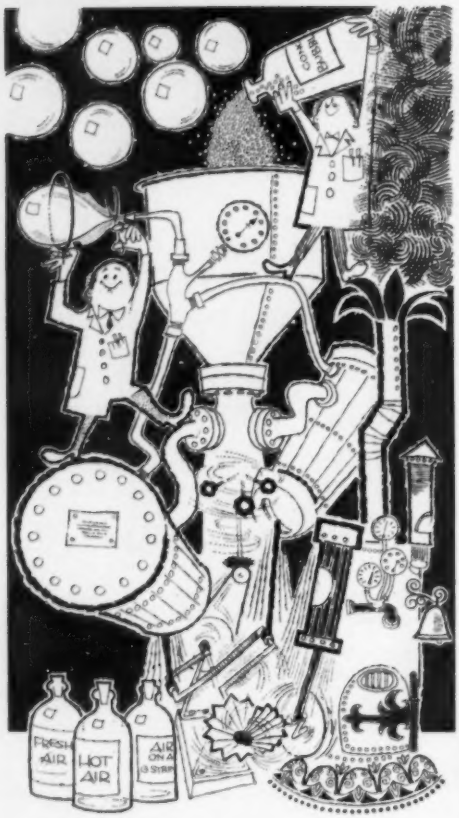

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IN ITS 76th YEAR

March 12 1960

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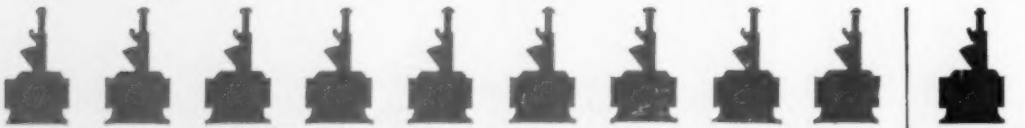

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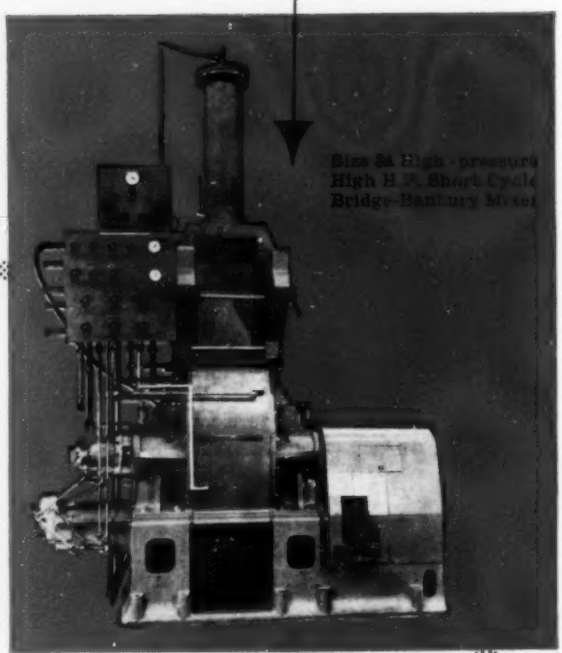

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NOTES of the WEEK

Record Plastics Sales

SALES of plastics materials during 1959 reached a record figure according to Board of Trade figures issued this week. This was, of course, generally anticipated, but considerable satisfaction must be felt all the same that the half-million-ton figure has been passed. The net figure, at 501,000 tons, is 85,000 tons up on 1958. This represents a satisfactory increase of over 20% and can be compared to the very slow 6% rate of growth in 1958 and the 16% rate during 1957. Perhaps the most notable fact to be gleaned from the figures is that the average rate of expansion in the last nine months of 1959 was even higher. The effort of the industry to export is reflected in a 28% rise to the record level of 146,000 tons. Although the increase was more or less evenly spread, sales to Australia and New Zealand were lower, and those to France and Germany showed no change. Interesting comparisons can be made with West Germany's production of plastics materials in 1959, reported in the Journal last week, which amounted to 794,000 tons, an increase of 28% over 1958. More than a quarter of this production was exported.

Rubber Outlook

THE view that releases from UK and USA rubber stockpiles will serve only to replenish trade stocks which have fallen below what might be regarded, in relation to current consumption, as the normal, was propounded by Sir John Hay, in his capacity as chairman of Linggi Plantations Ltd., in his circulated statement. Sir John goes on to say that the fact that the demand for natural rubber should continue at a level sufficient to absorb all production at a time when ample supplies of synthetic rubber are available, is significant and encouraging. He expressed the belief of the directors that demand for natural rubber through 1960 will continue at a high level. On recent Russian declarations of intent to liquidate stock, he remarks that it would not be surprising if the true intent is merely to release some of the stock to satellite countries for the requirements for which the original purchases were made.

Safety

MR T. W. McCULLOUGH, H.M. Chief Inspector of Factories, writing on safety in the *Financial Times* this week, has, as usual, some extremely interesting and important points to make. Those who were present at the National Safety Conference of the Rubber Industry—or who read *RJIP* reports, will undoubtedly remember his contribution on that occasion. Among a great number of facts and figures quoted in the *Financial Times*, Mr McCullough mentions a category which cannot be widely known. This concerned accidents connected with non-rail transport vehicles within factories. Accidents in this category have risen, says Mr McCullough, almost two and a half times in ten years, from 3,664 to 8,845. 'Anlysis of these reveals the usual causes: careless driving, excessive speed, bad vehicle maintenance, untrained or inexperienced drivers. A Highway Code for factories seems desirable.'

There must also be a number of other approaches to this particular problem. One of them, we suggest, would be for copies of those invaluable pamphlets on safety, compiled by Mr R. W. Lunn, to be freely distributed. Not only are they to the point but they make excellent reading. These single-page pamphlets, which appeared last year, one a week for fifty-two weeks, can now be had in bound book form from the NJIC for the Rubber Industry, Room 236, The Royal Exchange, Manchester, 2.

On the Wrong Scent

IN America they have added a new dimension to polythene packaging—smell. The polythene is scented to match the goods: a 'clean linen' smell for fresh laundry; 'pine' and 'spruce' for men's sports clothing, and 'cookie' for cookies.

This certainly opens up new sensory vistas, but we can see a number of problems arising. There are new problems for packers, for example: a package may now be not only wrongly labelled, but wrongly 'smelled.' We may run the risk of buying perfume smelling of hot cookies and potatoes draped in Chanel Number 5. There are, too, other difficulties. How, for instance, would manufacturers scent aspirins, or pepper? And would there have to be, in the larger supermarkets, a scent-free room for strained olfactory organs?

Difficult as it is now, Christmas will become impossible. We shall smell our presents for weeks before we get them. With these and other problems in mind, we urge British manufacturers of polythene film to leave well alone. We want natural polythene. We do not really want to smell our onions before we cut them.

NEWS *Briefs*

EUROPE'S BIGGEST STYRENE PRODUCER — MORE AVISUN POLYPROPYLENE — WESTERN CANADA'S FIRST TYRE — GOODRICH FACTORY IN BRAZIL

●**Malaya**—May 1 has been agreed as the target date for setting up the 'Rubber Association of Malaya and Singapore.' This will cover all aspects of the rubber trade and will admit all races on full membership.

●**Canada** — The first tyre has been assembled and cured at Firestone's new Calgary plant. Full production is due to get under way at this multi-million dollar plant — the first in Western Canada—in August.

●**India**—A £9m. chemical plant will be set up in collaboration with a group of West German firms consisting of Farbwerke Hoechst, BASF, and Bayer. An agreement in this respect has already been signed (*RJIP*, Feb. 27).

●**Israel**—Polypropylene yarn will be made in Israel within 12 months, with the annual output scheduled to reach 1,100 tons, it was disclosed by Mr I. Rogosin, chairman of Rogosin-Israel Industries. Machinery for the production of the yarn, valued at over £700,000 sterling, has already been ordered from Germany.

●**Canada**—Columbian Carbon Co. is to construct a carbon black plant in the Toronto area. The plant is expected to begin operations in 1961 with an initial annual capacity of approximately 40 million lb. of oil furnace blacks. It will be operated by Columbia's Canadian subsidiary.

●**Chile**—The Chilean Corporaciòn de Fomento de la Producciòn has received a report from a UN expert on the possibilities of establishing a plastics industry in Chile. The raw materials and chemicals required for this are present in sufficient quantities.

●**United States** — Avisun Corp. has announced plans for a substantial increase in polypropylene production. This follows the award of an engineering contract for a plant capable of producing 100,000,000lb. of polypropylene annually. A plant site has not yet been selected, but it will be located 'in the eastern part of the country.' The company already operates a polypropylene plant at Port Reading, New Jersey; capacity at this plant is being expanded to 25,000,000lb.

●**France**—The French Journal Officiel on March 4 announced changes in the list of strategic goods on which export controls still exist for shipments to East European countries. The changes include some further relaxation in the field of synthetic rubber. Similar announcements are being made by other COCOM members.

●**South Korea**—Fifty-two workers, including 50 women, were burned to death on March 2 when fire destroyed the Kukje rubber factory in Pusan, the largest plant of its type in South Korea. Early investigations showed the fire presumably was started by a discarded cigarette. It ignited petrol and other inflammable materials.

●**Germany** — Styrene manufactured by Chemische Werke Hüls reached on March 4 a total of 400,000 tons. The annual capacity of 84,000 tons of styrene monomer has consolidated Chemische Werke Hüls as the largest producer of styrene on the European Continent.

●**France**—A list of goods for which global quotas have been opened for the first six months of 1960 has been published. Importers are allowed to apply for licences to import the goods from any country in the convertible franc zone (excepting Egypt and Poland) and Uruguay. In certain cases the quotas stand for goods for which imports have been liberalized from the dollar zone and the OEEC. The list includes synthetic rubber, tyres and rubber articles.

●**Argentine**—Two chemical engineers from I.C.I. Ltd. will supervise the completion, and the start of production this month, of the first polyvinyl chloride factory to be built in Argentine in the Province of Santa Fe. Constructors were Electroclor, an Argentine associate of I.C.I.

●**Brazil** — Goodrich Tire Co. has opened a tyre and tube factory in Campinas, Sao Paulo. Initial production capacity is said to be 1,000 tyres and 1,000 tubes per day.

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SYNTHETIC RUBBERS

B1

Polythene

PART VI—A GLANCE AT THE FUTURE

(Concluded from March 5 issue, page 346)

By L. HINDS, Ph.D., B.Sc., A.R.C.S. (I.C.I. Ltd.)

SINCE production began in 1939 the world consumption of high-pressure polythene has grown to half a million tons per year—an unparalleled rate of growth. Before attempting a forecast of the immediate future of polythene as we know it today, and examining the possibility of new polymers emerging from polythene research, it is appropriate to consider some of the factors which will govern the development of the polythene market.

The Expanding Market

Fig. 9 shows how the market has developed since 1939, and there appears to be no reason why it should not continue to develop at the present high rate at least for a few years. A major depression would have a marked effect on polythene sales, but the outlook is more one of buoyant optimism, and of confidence that our eventual economic salvation lies in the development of the purchasing power of under-developed peoples, with the resulting general commercial expansion.

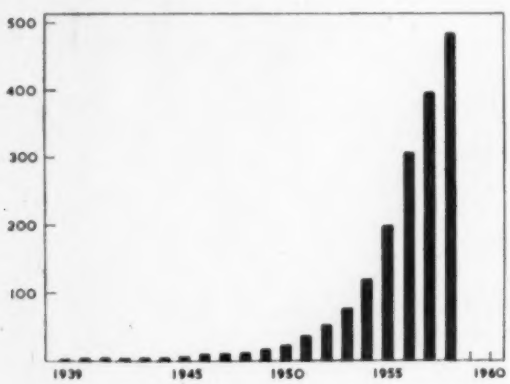


Fig. 9. World growth of high-pressure polythene consumption. (Vertical axis in thousands of tons)

Japan is already manufacturing polythene and, although little is known of the Russian plastics industry, the Russians have made it clear that considerable expansion of the petrochemicals industry is being planned, and that polyolefines will occupy a position of priority in the emerging plastics industry.

In the Western world the expansion of the market will probably depend mainly on the widening of the scope and acceptability of existing applications. Moulded products are well-established but the possibilities are endless, and film has hardly begun to affect the market for regenerated cellulose and paper, although because of its exceptional properties it has created outlets in packaging which did not formerly exist; the next few years are almost certain to show further inroads into the established packaging market.

The creation of new applications for polythene is the constant endeavour of the producers, and its use may reasonably be expected to extend to almost every conceivable industry. One cannot expect large new applications to appear daily, but the applied inventiveness of the large producers and the opportunities that polythene offers to quite small processors, in a free economy, cannot fail to result in a perennial crop of new outlets for polythene.

The main factors both in the expansion of existing applications and in the creation of new ones are the price of the raw material (see later) and the costs of conversion to saleable products. No really novel conversion process has appeared for some time, but constant modification of existing ones is bringing down costs: moulding cycles are constantly being reduced, and greater outputs are being demanded from extruders; new and improved conversion techniques and machinery are enabling films made by the faster chill-roll technique to compete with tubular film in packaging.

A concept, which is perhaps, symptomatic of our time, is 'disposability,' and the future of polythene will depend, to some extent, on how far the public will accept the principle of 'use once and throw away'—already accepted in packaging. Most of the polythene products manufactured today—except film and coated paper—are made to last and will do so almost indefinitely if required, but the days of 'disposable' toys are fast approaching and it is no great step to extend the idea to the kitchen and the vast market of housewares, where the use of colour and contemporary design is an inducement to occasional renewal.

The Price of Polythene

One of the characteristics of the price of polythene—and, indeed, of many plastics—is its freedom from fluctuation. Over the years, the price of polythene has gradually fallen: Fig. 10 shows the British price in recent years in terms of the amount of labour required of an average wage-earner to buy 1lb. of polythene. The fall in price is real and not merely a fluctuation: bearing in mind that polythene is a product of the vast mineral-oil industry and that it is a rapidly-growing product, it is reasonable to expect a non-fluctuating, gradually falling price.

How far the price will fall is a matter for speculation but it does not seem likely that substantial cuts in price can occur in the near future. Indeed it is not in the best interests of the industry that the price should fall below a level at which the manufacturers are able to make adequate provision for the very costly research and development work required for steady progress, and for the replacement of obsolete plants and the erection of new ones.

The nature of the polythene industry is such, at both the oil-cracking and the polymerization stages, that not only are large plants more economic than small ones, the minimum economic size is itself of ample proportions. For instance, the manufacture of ethylene suitable for polymerization is economic only in quantities of at least 10,000 tons per year.

These factors undoubtedly restrict the production of both ethylene and polythene to the very large chemical concerns in whose hands, therefore, are also vested the responsibilities for the future of the industry. Thus we

may expect a sound policy of price stabilization making adequate provision for normal expansion.

Polythenes and Polypropylene—The Market Conflict

In 1953 the work of Ziegler and Natta showed how ethylene could be polymerized without the very high pressures of the I.C.I. process, and hence without the very high capital investment required by this process. For a while there were suggestions of 'a back-yard process for making polythene,' and in a very short time pilot plants were erected and full-scale plants came on stream, producing high-density materials of greater rigidity and higher temperature-resistance than the conventional polythene. The alacrity of the manufacturers was not, however, paralleled by the development of high-density polythene sales.

As the new materials appeared on the market it was announced that polypropylene, another member of the polyolefines series, had been made in a form that had properties closely akin to those of high density polythenes. Its density, however, was even lower than that of low density polythene, and it had a number of technical advantages that are yet to be fully exploited. The impact of polypropylene on the scantily-established high-density polythenes market is expected to be intense, and it is now a commonly-held opinion that the whole gamut of useful properties of the polyolefines can be obtained from polythenes of low and intermediate densities and from polypropylene.

Expressed opinions and estimated tonnages, although interesting in themselves as the declared expectations of individuals or companies, are likely to be coloured by commercial interests and are therefore only fragmentary evidence in the assessment of total trends.

A more rewarding approach is the comparison of production capacity and sales volume. The production capacity of today represents the intentions of yesterday—not only the hopes and fears, but also the considered expectations seen in the cold light of investment policy. The difference between the volume of sales and the production capacity depends on several factors but can nevertheless be taken as a rough guide to how far yesterday's intentions were justified.

The annual world production capacity of low density polythene in 1959 was about 685,000 tons and the consumption in 1959 was about 630,000 tons. In the USA the production capacity in 1959 was about 498,000 tons with sales in 1959 of 468,000 tons.

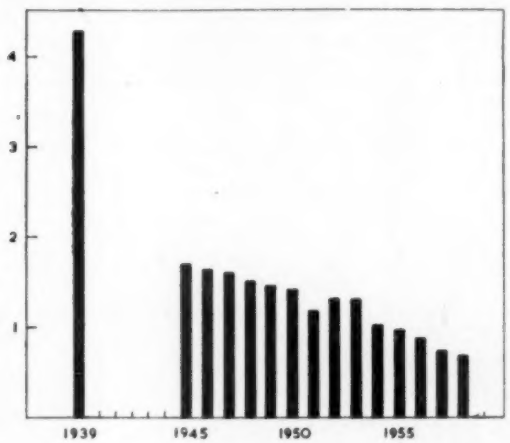


Fig. 10. Man-hours of effort (vertical axis) required to buy 1lb. of polythene

High-density polythenes made by the low - pressure process have followed a very different pattern. In the USA, where these materials have achieved more market acceptance than anywhere else, and where the great majority of the low pressure manufacturing capacity is situated, 45,000 tons were sold in 1959, although the production capacity in 1959 was 136,000 tons. Towards the end of 1959 and early in 1960, however, there have been reports that the high-density polythene plants have been working to full capacity.

Taking into account the announced future plans of the polythene manufacturers the world annual production capacity of high-pressure polythene is expected to grow to over a million tons per year in 1961 and it is reasonable to believe that sales will not lag far behind this figure. By 1961 the low-pressure production capacity for high-density polythenes is expected to reach 375,000 tons, but this expansion, as well as the development of the market for this type of materials, is complicated by the arrival of polypropylene. To what extent polypropylene will upset the incipient high-density polythene market must be gauged from the announced plans of the manufacturers: whereas the many plans for new polypropylene manufacturing capacity suggest firm confidence in the future of this product, a halt has been called to new high-density polythene manufacturing capacity beyond committed plans.

Ziegler polythene plants can be converted to the production of polypropylene; such conversions have already been reported in the USA, and more are expected.

It may be that the three types of rigid polyolefine will co-exist peacefully but the trend for conversion of Ziegler plants to polypropylene plants and the ease with which this can be done suggests that the market conflict may eventually resolve itself between high density polythene and polypropylene.

New Polymers and Copolymers

The success of making polypropylene in the isotactic form opens up new vistas to the polymer chemist and leads us to enquire what other olefines can be polymerized to give materials of commercial interest.

Butene-1 can be polymerized to the isotactic form; the polymer has properties very similar to those of low density polythene. Its crystalline melting point (125°C.) is much lower than that of polypropylene (165°C.); this fall in melting point is general to the series of isotactic polyolefines and is the main reason why higher members of the series than polybutene-1 are of little interest as plastics (since polythene is made from a symmetrical molecule, there is no question of tacticity, and it is not included in this series).

Polybutene-1 has an advantage over low density polythene in environmental stress-cracking, and film made from it has been shown to have outstanding tear-strength. It is possible that if surplus quantities of butene-1 should be available small quantities of the polymer may be made for special applications as, indeed, has already been reported from Italy, but it is unlikely that the price of butene-1 made specially for the purpose would be low enough to produce a polymer directly competitive with polythene.

Some branched olefines have been polymerized to produce high-melting-point materials but here again, as with olefines of more than four carbon atoms, the price of the olefines is likely

to prevent them from competing with established materials.

β-olefines have not yet been polymerized but polybutene-2—in atactic and isotactic forms—has been made from diazo-ethane.

Interest is being shown in the industry in the copolymerization of ethylene with materials containing vinyl groups, such as styrene, methyl methacrylate, vinyl acetate, etc., and because of the bulky side-groups being introduced it is hoped to obtain more rubber-like materials. As with higher olefines, the cost of these copolymers is almost certain to be higher than that of polythene and the applications envisaged for them are likely to be of a special nature, for instance, adhesives, finishes, ion-exchange resins, transparent films and waxes. There is particular interest in an announcement about the use of ethylene/propylene copolymers for the manufacture of motor-car tyres, where good resistance to high temperatures and ageing is claimed.

It has been known for some time that copolymers of ethylene and butene-1 can be made by the Phillips process, and during the past year these have been exploited commercially. In the USA these materials are finding extensive use for the manufacture of detergent bottles and of other containers; their ease of flow in processing, their stiffness and toughness, and their resistance to environmental stress-cracking make them particularly suitable for these applications, and further uses may be found for them.

A copolymer for moulding large articles has been announced in the USA; it is easy-flowing in processing but is nevertheless tough at low temperatures. The advent of copolymers on the market will add further to the diversity of the properties of polyolefines.

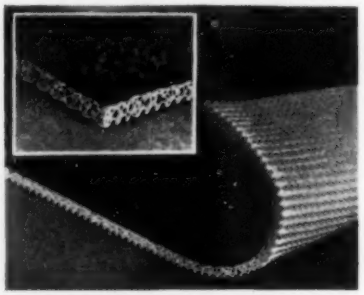
Conclusion

The position of polythene in the world market-place is assured. Other polyolefines and copolymers may be expected to broaden the already very wide usefulness of polythene and it may well be that some of today's less versatile plastics materials will be replaced by polyolefines in the future.

Today there is a greater production of polyolefines than of any other single type of plastics materials, this leading position having been taken from PVC within the last year; the short time that polythene has taken to reach this first place is a measure of the trust placed in the potential of the material and in the original manufacturing process, by the most powerful chemical concerns in the world—a trust that has been amply rewarded.

THE MILLION-AIRE

The North British Rubber Company, makers of the well-known Tredaire carpet underlay have introduced on Stand No. 158 at the Ideal Home Exhibition (Olympia, London, March 1-26) an interesting floor-



North British Rubber's 'Million-aire' sponge-rubber underlay, exhibited at the Ideal Home Exhibition

covering called 'Million-Aire.' This is a cut pile carpeting in which Courtaulds' fibre yarn is bonded with a deep sponge rubber underlay. Seven stippled colours have been chosen and named Coffee Ice, Spring Yellow, Grey Mist, Kingfisher, Cherry Glo, Quicksilver and Forest Glade. Retail prices per sq. yd. is approximately 45s. per yd., 54in. wide, 67s. 6d.

PIRELLI DIVIDEND

The Board of Societa Pirelli per Azioni has announced that it will propose to the shareholders' meeting on April 5 the distribution of a dividend of 140 lire per share for the year ending December 31 1959. This is unchanged from the previous year.

At the same meeting the Board will propose the raising of the company's capital to 28,000 million lire from 24,000 million. This will be done by the issue of four million new shares, of which three million will be a free scrip issue of one new share for every eight already held. The other million will be offered optionally to shareholders in the proportion of one new share for each 24 old shares held. The board will also seek the power to further increase the company's capital within a year to 30,000 million lire from 28,000 million.

G. C. W. Reid

G. C. W. Reid, founder of Reid (N.Z.) Rubber Mills Ltd., has died at Auckland, New Zealand, at the age of 72. An Australian, he started his factory in an old railway carriage at Penrose in 1934.

IRI News

A LECTURE, 'Tyres and the Modern Car' was given by E. S. Tompkins, B.Sc., A.R.P.S., A.I.R.I., on February 22, in Cork. Given in the recreation hall of the Irish Dunlop Co. Ltd., it was attended by some 150 people and included many well-known personalities of the tyre industry, automobile assemblers, and traders of Ireland. Prominent were T. Brennan, general manager, and T. O'Byrne, service manager, Fords (Ireland); F. Cross, past president of the SMMT (Ireland); W. Colclough, Renauto (Ireland); E. J. Power, assistant general manager, and C. V. Locke, regional sales manager, Irish Dunlop Co. Ltd., and J. T. Lawrence of Goodyear (Ireland).

The lecturer was introduced by the chairman, J. P. Ryan (works director, Irish Dunlop Co. Ltd.), who paid tribute to the work of Mr Tompkins in the field of tyre performance and design extending over many years. The lecture was illustrated by sound projector and slides, and was delivered by Mr Tompkins in a manner which left no doubt of his mastery of his subject. Question time quickly demonstrated the presence of a keen and lively interest in the subject. Questions about causes and types of tyre wear, mileage, balance, and future developments were fired at Mr Tompkins.

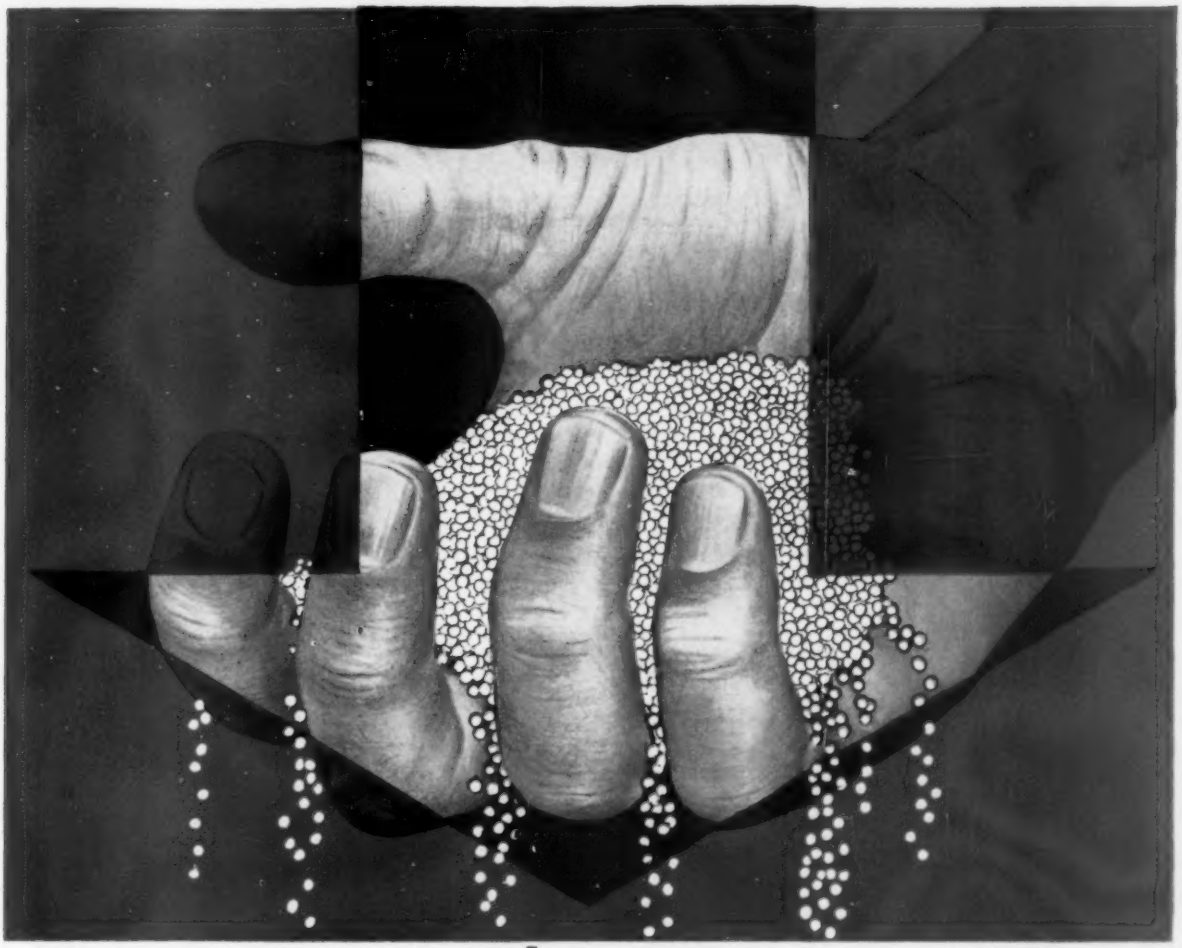
A vote of thanks was proposed by Mr. Brennan and seconded by Mr Cross.

Inaugural Meeting, S. Rhodesia

The inaugural meeting of the Rhodesian Section will take place in Gwelo, on March 19. Dr K. Fiksl, managing director of the Rhodesian Bata Shoe Company Ltd., has placed the Bata Club Hall at the disposal of the section, and his company will be host to members, their wives and guests. A programme has been drawn up which includes a tour of the Bata factory in the morning followed by lunch at the Bata Club.

Inaugural Meeting, Ceylon

Tentative arrangements have been made for the inaugural meeting of the Ceylon Section to take place this month in the auditorium of the Institute of Scientific and Industrial Research, Colombo. Dr A. Sundralingam, who was recently elected a Fellow of the Institution, is the newly-appointed Director of the Institute



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International Standardization

NEW YORK 1959 MEETING OF ISO/TC 45*

By J. M. BUIST (I.C.I.), Chairman of ISO/TC 45

THIS was the second meeting of Committee TC 45 to be held in America, the first being held in Akron in 1950. Thirty-five delegates attended the Akron meeting at a time when the committee was establishing confidence between delegations, and working out satisfactory procedures for interchanging the experience between the various delegations. The foundations laid then proved to be very sound, and the work of TC 45 has proceeded smoothly and steadily since that time. At the present meeting several important decisions were made affecting the future work of this committee.

Reorganization of Work

Up to present, the UK, as Secretariat, have borne the main burden of organizing test programmes for inter-laboratory comparison of many test methods, and these programmes have played an important part in establishing the sound background necessary for drawing up good, acceptable, international test methods. For sound reasons initially, TC 45 confined its interests to testing methods, since they are the foundation of product specifications; but the object of the International Organization, as set out in its constitution, is: 'To promote the development of standards in the world with a view to facilitating international exchange of goods and services and to developing mutual co-operation in the sphere of intellectual, scientific, technological and economic activity.'

The drawing up of standard methods of test therefore can only be a first step. At the 1957 meeting in Zurich it was felt that the work had got to a stage where the responsibility for organizing particular pieces of work and preparing draft standard methods could be shared with several other member countries. It was agreed in New York that there would be a new arrangement of working groups, designed to avoid setting up a large number of separate groups for individual subjects. The new working groups, designated A to L, and the country responsible for the work are:

A (Italy): Chemical tests other than latex.
B (Germany): Tests on latex.
C (USA): Physical tests on unvulcanized rubbers.
D (USA): Physical tests on vulcanized rubbers (other than those in Group E).
E (Germany): Determination of visco-elastic properties of vulcanized rubbers.
F (UK): Degradation tests, including ageing, abrasion and flex cracking.

J. M. BUIST

G (UK): Electrical tests and tests on ebonite; anti-static rubbers and ebonite products.
H (UK): Flexible Cellular Materials (other than cellular ebonite); test methods and products.
J (Netherlands): Classification of vulcanized rubbers.
K (Convenor to be decided): Products not included in other working groups.
L (France): Terms and definitions.

Because of these changes the opportunity was taken to have useful discussions, both formal and informal, with leaders of delegations on the procedure to be followed in carrying out the work and reporting progress.

Products Specifications

Having reorganized the working groups a most important discussion took place on product specifications, and Dr J. R. Scott (UK) reported that the following suggestions had been received with draft ISO proposals:

1. Natural rubber rings for joints of water piping.
2. Anti-static rubber footwear for use in hospitals.
3. Rubber safety boots.
4. Latex foam rubber hospital mattresses.
5. Latex foam rubber components for furniture.
6. Latex foam rubber components for transport seating.
7. Raw styrene-butadiene rubber types 1500 and 1710.
8. Rubber flooring.

Suggestions were also received for the following, although no documents are yet available:

9. Ebonite for general and electrical purposes.
10. Electrical resistance of anti-static rubber components for hospitals.
11. Hose.
12. Raw natural rubber.
13. Natural and synthetic rubber latices.

To enable work to proceed with the minimum of delay it was decided to allocate several of these items to working groups already established under the new arrangement: 4, 5 and 6 to working group H; 7 and 12 initially to A and C; 13 to B; 9 and 10 to G. The new working group K, comprising representatives from France, Germany, India, Italy, Netherlands, Sweden, UK, USA, and USSR, will take over items 1, 2, 3, 8 and 11.

By allocating some of these subjects to the appropriate existing working groups of TC 45, it is possible for work to start immediately. It has still to be decided which country convenes working group K but once this is decided work should proceed quickly.

Flexible Cellular Materials

This working group (H) met for the first time in New York and was in favour of closer co-operation between ISO/TC 45 and ISO/TC 61 (Plastics) on the subject of cellular materials. Because of the difficulty in precisely defining rubber and plastics materials, it was proposed that ISO/TC 45 and ISO/TC 61 should agree jointly and refer spheres of work to the appropriate technical committee, and secondly to form a working group where this was considered necessary should any material not be

* *This account of the 8th meeting of Committee TC 45, Rubber, of the International Organization for Standardization is published with the approval of the Secretariat Sub-Committee (ISO) on Rubber of the British Standards Institution and of the UK Delegation to ISO/TC 45.*

In this case, the thought that the solvent recovery unit installed a year or two ago has already covered its cost and is paying dividends. A Sutcliffe, Speakman recovery plant adsorbs by active carbon valuable solvents which would otherwise be lost by evaporation, and returns them for re-use over and over again. Substantial savings—delighted director.

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appropriate to one or the other technical committee.

The UK agreed to prepare a list of materials to be considered by such a joint body and this will be circulated for postal comment and approval.

The question of terms and definitions was discussed and it was agreed that all members of the working group should supply the convenor with a list of terms and definitions used by them in this field.

All members agreed to supply the convenor with copies of any specifications, or of draft specifications now in preparation, together with a short statement indicating major points. The UK will then prepare a comparison of the various specifications with a list of the tests used, and an indication of any differences in the methods of test. The draft methods on Flexible Urethane Foam Components for Transport being prepared by PLC/RUC/1 will be referred to this working group for consideration, along with the three draft proposals on latex foam.

Committee ISO/TC 61 met in Munich about the same time as TC 45 was meeting in New York and approved that there should be close co-operation between the two committees in this field. It remains for these two bodies to discuss the best way to get this.

Latex Tests

This working group presented methods for density, nitrogen content, volatile fatty acid number and coagulum which were accepted by the Plenary Session and will now be circulated as draft ISO proposals for postal approval or comment by all the member countries of ISO/TC 45. It was agreed to start work on tests for synthetic latices and a start will be made by reviewing the current ASTM procedures applicable to SBR latex.

Raw Rubber

The working group dealing with chemical tests produced methods for volatile matter, ash and dirt, which are to be circulated for approval as draft recommendations. The procedure for preparing the test portion in the method for direct determination of natural rubber hydrocarbon has been shown to influence the result of the analysis, and so a section describing the procedure will be included in this method. The procedure accepted previously for sampling bales of natural rubber was discussed again. It was agreed to amplify the existing proposals by including a procedure based on statistical principles of sampling.

The draft ISO proposals for Mooney viscosity and for determination of rate of cure by the Mooney viscometer were modified slightly in the light of comments; they will now be submitted for approval as draft ISO recommendations.

Mr Baker (UK) had organized extensive inter-laboratory tests on experimental mixing and vulcanization procedures for natural rubber. This work had revealed several interesting points, and showed that these procedures still do not give adequate agreement between laboratories. Further work is to be done under more closely controlled mixing conditions, with at least four grades of rubber, to see if the differences between them can be measured consistently by several laboratories.

Hardness

ISO Recommendation R48 was issued in 1957 and Dr Scott (UK) who was largely responsible for developing the method and having it adopted by TC 45, reviewed some suggested modifications which are to be circulated to all members for postal approval. These consist of replacing the present single ball size (2.44 ± 0.06mm., the wide tolerance being designed to include both 2.38mm. ($\frac{3}{32}$in.) and 2.50mm. ball bearing sizes) by giving 2.38 and 2.50mm. as alternative sizes but with only ± 0.01mm. tolerance in each case. The present total load of 570 ± 5g. would be replaced by two different loads (564 ± 2 and 580 ± 2g.) corresponding to these two ball sizes. These changes should make the test method more precise.

The Draft Proposal for a microhardness test, with all linear dimensions scaled down to one-sixth of those in the standard hardness test, was accepted by the Committee. This method is essentially the same as the one described in BS 903, Part A20, 1959.

Resistance to Liquids

A new standard test liquid (50:50 mixture of iso-octane and toluene) was adopted in addition to the 70:30 iso-octane mixture and ASTM oils 1 and 3 already included in the draft procedure.

The volumetric and dimensional-change methods of measuring swelling were retained, but the linear swelling method was deleted. The voluminometer method proposed by the Netherlands was discussed further but more information on experience with this method was called for. Methods for determining the amount of soluble matter extracted by the swelling liquid and measuring the hardness and stress strain, both of the swollen rubber, and of the rubber after drying out the absorbed liquid, were discussed and are included in the revised procedures.

Compression Set

In the report of the 1957 meeting[1] reference was made to the very wide divergences in compression set results obtained in co-operative work between different laboratories. Many points remained to be resolved and a great deal of further experimental work was carried out by several delegations, and Mr F. H. Edwards (UK) who was convenor of the working group is to be congratulated on the progress made during the last two years. At the New York meeting these points were agreed:

(1) Size of test piece. The meeting agreed that two sizes of test piece should be adopted of the following sizes and tolerances.
(a) Large. 13.0 ± 0.5mm. thickness, 29.0 ± 0.5mm. diameter.
(b) Small. 6.0 ± 0.2mm. thickness, 13 ± 0.5mm. diameter.

(2) The UK proposal to adopt a uniform degree of compression 25% was accepted for all rubbers of hardness between 30 and 94 International Rubber Hardness Degrees.

(3) The French delegation proposed that the use of a lubricant on the clamping surfaces should be left optional and that where used the lubricant should be a silicone fluid.

(4) The following times and temperatures of test were adopted:
22 ± 2 hours at 70°C.
22 ± 2 hours at 100°C.
3 days at 20°C.

(5) Delegates were unanimous that recovery should be allowed to take place at room temperature rather than at the test temperature.

(6) The tolerances on the spacers were important and the spacer heights for the large and small test pieces would be 9.75 ± 0.01 mm. and 4.5 ± 0.01mm. respectively.

A draft proposal incorporating these agreements will now be circulated for postal ballot.

Low Temperature Resistance

At the 1957 meeting it was agreed that Draft ISO Proposals should be prepared for these tests: (a) Determination of Impact Brittleness Temperature of Elastomers, based on ASTM D.746-52T. (b) Determination of the Stiffness of Elastomers at low temperature, based on ASTM D.1053-52T.

These drafts had been circulated

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and certain comments and criticisms were resolved by the working group. The brittleness method has been amended in certain details and will now be circulated as a draft ISO recommendation. In the case of the torsional stiffness method further experimental work will be carried out by France, Italy, Sweden, Germany, and the UK to determine whether or not differences occurred when the heat transfer medium was either liquid or gaseous.

Further work had been done on procedures for carrying out hardness and compression set tests at low temperatures; but in neither case could definite recommendations be made at this stage.

Dynamic Properties

This was the first meeting of working group E under the convenorship of Germany and very wisely the group first of all laid down guiding principles for its future work. It was decided to limit the work of this group to non-destructive tests for evaluating visco-elastic properties of cross-linked elastomers. The conclusion was that standardization of impact resilience or forced-vibration dynamic tests should not be undertaken immediately. Comparison tests shall be made to determine the influence of sample dimensions and apparatus type on samples submitted by Germany.

Ageing

The draft ozone-cracking test procedure, drawn up on the basis of principles agreed at the 1957 meeting[1] was further discussed. The strip test piece with parallel sides was agreed, it being considered unnecessary to specify dimensions. Shaped test pieces were considered, including the 'double wedge' submitted by the Netherlands delegation, and the UK agreed to prepare, for postal comment and approval, a programme of tests comparing variously shaped (wedge, double wedge, dumb-bell, and bent loop) test pieces, with straight test pieces (at various elongations) as control.

France, Germany, Netherlands, Sweden, USA, USSR and UK agreed to participate in these tests. It was agreed to specify these ozone concentrations: (i) 25 and 50 parts per 100 million for normal exposure tests. (ii) For tests on cables or other electrical applications an ozone concentration of 15,000 parts per 100 million (0.015%).

Low concentration tests should be carried out in the dark, it was thought, preferably in a chamber having a transparent window enabling observation from the outside by an optical method; where such facilities were not available, there was no objection to the removal of the test pieces for examination. High concentration tests could be carried out in a chamber with an observation window and with illumination.

It was agreed that the chamber should preferably be fitted with a mechanically rotated frame for holding the specimens, the frame to be rotated at two revolutions per minute. As an alternative, the use should be permitted of stationary specimens provided that the chamber is equipped with a fan to ensure good air circulation in the chamber. The ratio of surface area of specimens to volume of air in the chamber should not exceed 1 to 10 (in cm.^{2} and cm.^{3} units). The air should be introduced into the chamber through a deflector to minimize the formation of pockets of varying concentrations. The rate of air circulation is to be between 3/4 and 2 changes per minute.

To allow for exudation of protective agents, it was agreed that at least x days (figure to be decided) should elapse before the test pieces are inserted into the clamps prior to the 48-hour conditioning period.

The USSR delegation said that they had carried out a comparison of the USSR and Netherlands methods of estimating ozone concentration and had found the latter to be easier and more accurate. The Netherlands method[2] was therefore adopted as the standard method.

Unfortunately it had not been possible to circulate before the meeting a report on extensive inter-laboratory light ageing investigations with Xenon lamps and other light sources, so it was not discussed in detail, but delegates will send in written comments. Results so far emphasize the importance of controlling the temperature of the rubber, if the results are to reproduce the effects of outdoor exposure. The convenor was instructed to approach the manufacturer of the Xenotest apparatus to find out whether the temperature could be more closely controlled during testing.

Electrically Conductive Rubber

At the 1957 meeting excellent progress was made with methods of measuring resistivity of conductive and anti-static rubbers, but since then there has been disagreement on the form of the test piece. A thicker test piece (2mm.) has been suggested by the USA and this matter has been referred back to the national standards bodies of member countries.

Other Methods

Excellent progress was made with other matters. For example, the first Draft ISO Proposal listing the properties and the graduations of property values to form the basis for a classification of vulcanized rubbers, was agreed for circulation and postal ballot. The methods agreed for determining copper and manganese in natural rubber will form the basis of methods for determining these metals in synthetic rubbers. Two procedures for rubber/metal bond strength[1] (direct tension and stripping) were agreed. Italian and USSR methods for tests in shear are now to be studied.

Work on terms and definitions continues and in future this subject will be under the capable guidance of the French delegation.

Three standard atmospheres were approved: 20°C. and 65% relative humidity; 23°C. and 50% rh; 27°C. and 65% rh. The temperature tolerance will normally be ± 2°C. but ± 1°C. will apply when necessary. Control of humidity will apply only when dealing with materials that are sensitive to humidity changes. Minimum conditioning periods will be 16 hours where humidity is controlled, 3 hours when only temperature is controlled.

A small dumb-bell test piece already standardized internationally by the CEE (International Commission on Rules for the Approval of Electrical Equipment) was agreed. Certain modifications to the tolerances in the standard dumb-bell test piece were suggested and will be circulated for approval.

General

At the opening meeting, when Admiral D. F. Hussey, Jun., managing director of the American Standards Association, welcomed the fifty-eight delegates from ten countries, the writer in his capacity as chairman thanked the American Standards Association for their excellent preparatory work and paid tribute to the memories of Dr S. Oberto, Italy, Professor Nitsche, Germany, and Mr S. Doner, America, who had all been loyal supporters of TC 45 and whose help had contributed greatly to the progress made so far.

During the New York meetings about forty proposals covering different test methods were discussed and about half that number were accepted. This represents a vast amount of work by all the delegations and our American hosts can be happy and satisfied that all the arrangements they made for the meeting operated smoothly and efficiently. A small organizing committee, with Mr Vacca and Mr Winspear among its members, did its work quietly and most efficiently.

During the week it was said: 'If

Continued on page 392

Crystallization of High Polymers

SOME NEW ASPECTS

CRYSTALLIZATION of high polymers was the subject of a lecture given at the Society for Chemical Industry (Plastics and Polymer Group) on March 1 by Dr A. Keller, of Bristol University.

Long-chain molecules can form crystallites, he said. They aligned themselves in a parallel direction and the crystal was defined by a small repeat unit in two directions. (Fig. 1.) To fit this into a small latice, the distance (a) gave the dimension in one direction and (d) that in the

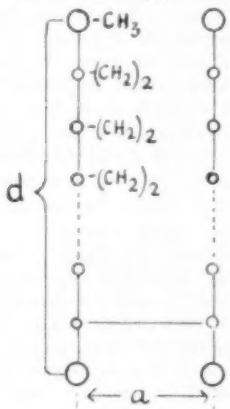

Fig. 1

other, which was characteristic of the length of the molecule. If, however, the size of the molecule was increased a sub-cell within the large unit was the only unit cell recognizable. There was also an extraneous periodicity not properly understood.

In recent work the crystallinity of paraffin molecules had been brought closer to that of polymers. The size of the crystallite was much smaller than that of the molecule. This consideration had led to the Bunn model which had been very valuable — it postulated a random assembly of crystalline miscelles.

Later, spherulites had been discovered by Bunn and showed organized structures within a microscopic region. Black crosses were seen under the polarizing microscope. The spherulites corresponded to grain structure in metal, but were more difficult to study. Spherulites also occurred in minerals, but in this case were anomalous; in polymers they were the normal structure. They started as fibre-like bodies and developed into circular structures. As well as the dark crosses, concentric rings may be seen—the crystallites rotated along a radial axis and gave rise to patterns, frequently very beautiful.

X-ray diffraction could be used on a small portion only of the spherulites (Fig. 2), and this showed the molecules to be arranged tangentially. Penetration into the spherulites

Fig. 2

was very difficult, and could not be achieved with the electron microscope.

Polythene Crystals

Marlex and other low-pressure polythenes may be dissolved in hot benzene, allowed to crystallize, and the crystals examined. Well-defined single crystals were formed, and thin uniform layers were first noted—the mode of crystal growth was the same as with the paraffins. The crystals can degenerate into dendridic forms.

The structure of these crystals had been studied by X-ray diffraction, and it was found that long chains occurred, normal to thin layers. The molecules of nylon, which crystallized in fibrils, were not arranged along the length, but at right angles to the fibrils. Dr Gordon had sent from Edinburgh compounds of a structure shown in Fig. 3, and these had been examined.

Most polymers can give fibrils, and the molecules lie across, not along

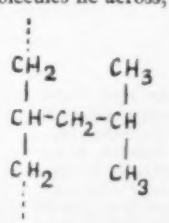

Fig. 3

the length; there were also tubular crystals only about 100 Å thick. The molecular chain was assumed to be folded inside the crystal like a Chinese cracker. A paraffin chain was similar: a crystallographer would say that the chain length corresponded to the layer of thickness. (See Fig. 4). The distance between the spots in the X-ray diffraction pattern corresponded to the layer thickness. Low molecular weight polythene was investigated and the same chain length was found, but when the chain

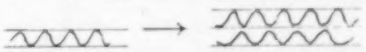

Fig. 4

length was reduced further it was found not to be folded. (Fig. 5.) The question arose, Dr Keller asked, why are the polymer molecules folded with such regularity? The folded

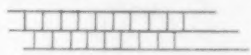

Fig. 5

length depended on the temperature of crystallization and is therefore not a chemical effect. From Fig. 6 it would be seen that higher temperatures gave longer folds. The tangled

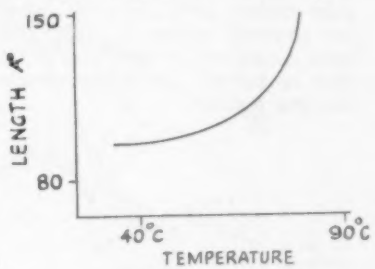

Fig. 6

chain first started a nucleus and the regular folded structure resulted. This was one theory. Another was that there was a critical length depending on the free energy.

When using the electron microscope the electron beam destroys the structure, so that the actual crystals cannot be seen: what was seen was only a shell. Patterns may, however, be detected. Sometimes leaflike structures due to twisted crystallization were visible. Moiré fringes arose by superposition of two layers and there were also black fringes. The molecules probably folded themselves along the growing face of the crystal so that there were four different structures in the crystal. (See Fig. 7.) These could actually be seen in the photographs.

Some crystals had truncated faces. Normally, only the structure of Fig. 8 may be seen, but under proper con-

ditions wedge-shaped structures based on the truncated faces were also visible. The central fold showed creases—this may come from a crystal of pyramid shape.

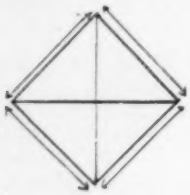

Fig. 7

If the crystal was heated, the quadrant shaped portions coming from the truncated ends melted first. (Fig. 9.) There were thus six different crystals, two of which had different melting points.

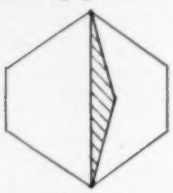

Fig. 8

A drawn polythene fibre shrank on warming, due to rotation of the molecular chains. The effect of heating the observed crystals is exactly the same. Could any of the chains in the fibre be folded? Dr Keller thought this was possible.

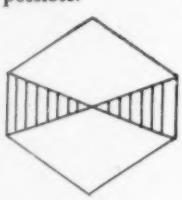

Fig. 9

A film method for investigating individual crystals showed a striated structure; these folded up like an accordion on heating to give a sheave-like structure. If these sheaves kept on branching the formation of spherulites was observed. This effect was due to heat, but it may be possible to produce it without heat and research was going on in this direction.

Individually tailored car covers which need no tying down have been made from Melloroid Geon PVC. The cover is fitted with strong elastic at each end and ensures a firm hold on the car even in high winds. Another feature is the presence of four reflectors—two white in front and two red at the rear.

India Must Grow More Rubber

The need to double India's production of natural rubber was stressed by Mr John Luckham on Tuesday, when making his presidential address to the Rubber Industry Institute.

He estimated that after taking into account that the synthetic rubber plant at Bareilly might produce 30,000 tons a year, it would still leave a gap of 56,000 tons for natural rubber. As against this, he said, the production of rubber in the country was only 24,790 tons in 1959.

Mr Luckham pointed out that one of the two existing tyre manufacturing firms had opened a new factory in Madras. A new factory had been set up in Bombay and initial production was getting under way. The US Export-Import Bank had recently approved a credit of 22.5 million rupees to help set up a tyre factory in Delhi and another factory was to be established in Kerala. The Government of India had also approved yet another plant for the West Bengal.

Enka Cut Prices

Britsh Enka announces that the prices of all its high-tenacity tyre yarns have been reduced by 3d. a lb. Demand remains at a high level, it is stated.

A similar reduction in the price of high-tenacity yarn was announced by Courtaulds on March 1 (*RJIP*, March 5).

INTERNATIONAL STANDARDIZATION

Continued from page 390

our work has been done well, then the international standard is something very worthwhile and better than any of our national standards. This position is being rapidly approached and its attainment has only been possible because of the very great mutual trust, faith, and understanding that has existed between all our delegations. There is no feeling of complacency among delegates about the progress made by TC 45—much remains to be done—but all delegates felt that the work done in New York had gone well and that each had played his part.

REFERENCES

[1] *RJIP*, 1957, **133**, 930.
[2] Van Pul, BICF, Trans. Inst. Rubber Ind., 1958, **34**, 28.

NEW SYNTHETIC

A new type of 'Hypalon' synthetic rubber has been announced in Europe by Du Pont. They claim that the new material has improved processibility. Called 'Hypalon' 40, the new type is said to have improved tensile and tear strength, elongation characteristics, compression set, resistance to abrasion, and in addition, flame and oil resistance comparable to neoprene.

Extensive tests in commercial plants producing wire and cable, hose, coated fabrics, extruded and moulded goods, and industrial rolls, have been carried out to show the processibility of the synthetic, which readily accepts fillers, giving fast mixing cycles both on open mills and in internal mixers. Mixed stock is free from 'nerve' and roll sticking. Its thermoplastic nature in the unvulcanized state allows mixing and processing temperatures to be kept low, with resulting freedom from scorching.

Du Pont say that 'Hypalon' 40 is expected to find its greatest use in wire jackets, hose, tubes and covers, coated fabrics, and extruded goods. Other important fields are expected in moulded goods, belting, industrial rolls, packings and gaskets, and tank linings.

The bodies and hub-caps of these children's roller skates manufactured by Davies Steel Specialities Ltd., Kingswood Estate, Pembroke Dock, South Wales, are moulded in 'Rigidex' polythene produced by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

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Plastics Materials in 1959

RECORD SALES

BOARD of Trade figures issued on March 8 show that in 1959 net sales of plastics materials were 501,000 tons; 85,000 tons, or over 20% higher than in 1958. Thus, the rapid rate of growth (16%) achieved in 1957 was surpassed last year, contrasting with the relatively slow rate of growth of 6% during 1958. The average rate of expansion in the last nine months of 1959 was even higher; sales during the first quarter having still been influenced to some extent by the 1958 recession.

Although increased home market sales made the largest contribution in 1959 to the expansion in total sales, exports rose by nearly 32,000 tons to the record level of 146,000 tons, almost 28% higher than in the previous year. Especially notable were exports to Hong Kong at nearly 12,000 tons, more than 7,000 tons higher than in 1958. Imports also increased to 54,000 tons (13,000 tons, or almost 32% up on the previous year).

The main expansion was again in sales of thermoplastics, a quarter higher than in 1958; however, sales of thermosetting materials which had increased little between 1955 and 1958, expanded considerably, by nearly 13%. By far the largest increase was again in sales of polythene, 44% higher than in 1958. There were also sizeable increases in sales of PVC, polystyrene and acrylics. The only thermoplastics showing virtually no change were the cellulose plastics. In the thermosetting group, expansion was spread fairly evenly over the three types — alkyds, aminoplastics and phenolics and cresylics—which account for the bulk of this output. During the year sales of polyesters continued to expand very rapidly, and sales of epoxide resins resumed the rapid advance which suffered a temporary check in 1958; these materials still, however, account for a fairly small proportion of total sales.

NET SALES OF PLASTICS MATERIALS
(Thousand Tons)

	1958	1959
Thermosetting materials:		
Alkyds	44.7	49.7
Aminoplastics	49.9	54.6
Phenolics and cresylics	65.4	73.3
Polyesters	4.7	6.7
Other (*a*)	6.3	8.5
Total thermosetting	171.0	192.8
Thermoplastic materials:		
Cellulose plastics ..	11.6	11.7
Polyvinyl chloride (*b*) ..	73.3	88.3
Polystyrene	33.2	39.3
Polyvinyl acetate ..	12.1	13.2
Other (*c*)	114.5	155.4
Total thermoplastic	244.6	307.9
Total, all plastics materials	415.6	500.8

Note: Any apparent discrepancies are due to rounding of figures.

(*a*) Including epoxide resins and casein plastics.

(*b*) Excluding sales of resins (i.e. polymers sold as such).

(*c*) Including acrylics, polyamides, polytetrafluorethylene, polythene, polyvinyl chloride resins (i.e. polymers sold as such).

Rubber Stockpile

Sales from the Board of Trade's stock of natural rubber in February totalled 3,920 tons, for delivery as follows:

Spot	215 tons
March delivery ..	365 tons
April delivery ...	1,655 tons
May delivery ...	1,685 tons

Stocks at the Board's depots at the end of February, including rubber sold for forward delivery, amounted to 72,165 tons.

This ornamental window on an American garage door is vacuum-formed from Eastman's Tenite butyrate sheet. The lattice and shutters forming the window unit are marketed in an easily installed kit

RESIDENTIAL COURSE

A short residential course in Practical Rubber Technology will be held at Newton Heath Technical College from April 5 to April 14. The course is essentially practical in nature and the fully-equipped laboratories and workshops will be available. Instruction will be provided in the handling of natural and synthetic rubbers, including mastication, mixing, calendering, extruding, spreading, moulding and vulcanization; tension and compression stress-strain tests, tear, abrasion and flexing resistance, resilience, hysteresis and low temperature testing. Practice in latex compounding and fabrication is an optional part of the course.

The course will involve about 70 hours of practical technology as well as a number of optional short lectures on topics of general importance.

The total cost of the course including accommodation at the YMCA Residential Club and tuition is £12 10s., and further details may be obtained from the Applied Science Department of the College, Newton Heath, Manchester 10.

'CM' in Profile

Mr H. G. W. Chichester-Miles, president of the Federation of British Rubber and Allied Manufacturers, is the subject of an article in the winter issue of 'Catalyst.' The article deals interestingly not only with Mr Chichester-Miles' beginnings in the rubber industry but with the influence he has had, and is having, on the work of the Federation. It is, for instance, pointed out that part of the work of the Federation during the past year or so has been devoted to the important attempt to rationalize rubber product specifications—a move that will undoubtedly benefit users and manufacturers alike.

The article, and others in the issue, is notably up to the high standard of this very fine quarterly industrial journal published by the Shell Chemical Co. Ltd.

Research Head for Britain

The Controller of Rubber Research, Sir Geoffrey Clay, will leave for Britain next month, it is reported. Object of his visit is said to be the new plan to reorganize rubber research and development work (*RJIP*, March 5).

Sir Geoffrey said in Kuala Lumpur on March 2 that it was now possible to embark on a 'properly orientated and fully integrated' plan to protect the interests of the rubber industry.

VIEWS *and* REVIEWS

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **Dr Schidrowitz**

Rheology and Buna Latices

'THE Significance of Rheology in Rubber Processing. 2. Studies of Latex,' is the title of a paper by Kurt Edelmann and Edith Horn of the Institut für Faserstoff-Forschung der Deutschen Akademie der Wissenschaften, Berlin. This has been translated for *Rubber Chemistry and Technology* (Vol. 32, No. 4, Oct.-Nov. 1959, pp. 1050-1061) from *Gummi und Asbest* (Vol. 12, Feb. 1959, pp. 66, etc.).

The first part of this investigation was carried out with rubber solutions and the work has now been extended to synthetic rubber latex. As the authors observe: 'With the increasing use of latex, it becomes more and more urgent to devise new methods of studying this colloidal system, so that reproducible characterization of a particular latex may be assured. . . . From a knowledge of its flow characteristics, a latex with the necessary flow behaviour can be chosen for some special mechanical processing, such as the production of foamed rubber, adhesives and latex paints.

Summary

In their summary, the authors state that: '. . . Results are reported for the study of the rheological behaviour of several Buna latices, using a Höppler Rheo-viscometer. The flow curves obtained in this way show a different type of non-Newtonian flow from solutions of rubber. The region of η_0 (viscosity at rest) is absent. With increasing velocity gradient, the viscosity becomes smaller and smaller and finally reaches a constant value at a relatively high velocity gradient. That is, non-Newtonian flow passes gradually over into Newtonian flow.

'For those latices whose Newtonian flow lies within the measurable range, a general flow equation is given which includes the Newtonian portion of the shear stress together with a stress correction. This equation of flow can be used to define the rheological behaviour of the latices.

'The cause of this type of rheological behaviour is found in the thixotropic properties of the latex system. If a Höppler Rheo-viscometer is used and measurements are made first at increasing and then at decreasing shear stresses, the plotted data show a hysteresis loop which is evidence of thixotropy. With those latex systems for which the Newtonian flow behaviour falls within the limits of the measurements, and which can be called fluids, the viscosities measured with decreasing shear stresses lie below those which are measured with increasing shear stresses.

'On the other hand, highly-concentrated latices which can be considered as having a gel structure throughout, such as the 70% Buna-latex S3 used in this work, display a different kind of thixotropic behaviour. In such cases, the viscosities measured with decreasing stresses are higher than those measured with increasing shear stresses. A different flow equation is needed to define this different type of thixotropy.'

Polyether Foam

'Polyether Foam—Dunlopillo Starts a New Industry at Rochdale' is the heading of a highly-interesting article in the January edition of the *Dunlop Gazette*.

Latex foam, although extremely comfortable, is relatively expensive. Unlike tyres, which are essential regardless of how high the price may be forced by the price of natural rubber, latex foam could be dispensed with if the price of latex rose too high. 'A purchaser always had the alternative of being less comfortable—but richer—reclining on springs.' What was needed was a raw material, the price of which could be controlled.

'This was the situation up to about ten years ago, when a new discovery, the polyurethane group of synthetic foams, appeared on the scene. . . . The early types of synthetic foam had their uses, and still have, though they were much less than perfect as cushioning materials. But more experiment soon showed that not one, but many types of rubber-like foam could be made by stringing together chemically in various ways the molecules of which the synthetic material was formed. It was a matter of deciding by experiment which chemical combination gave best the desired qualities of toughness combined with softness and resilience needed for cushioning. . . .

'For the job of cushioning, polyether foam is the best type so far discovered and this has been found to compare with natural latex foam in resilience, while in some respects it might even be considered superior to it; for example, in its tensile strength. For the present, however, it appears likely that this alternative to natural latex will be more suitable for less-complicated types of cushions, mainly for the fireside type of chair, which will be required in great quantity, while natural or synthetic latex will reign supreme for bedding and for many other uses. Another interesting possibility may be to combine the two types of foam in one product. . . .

'Polyether foam, however, was found to offer a sensational new advantage; an uncomplicated method (uncomplicated once the technique had been worked out, that is) of manufacture, which should, when fully developed, make it possible to produce the new synthetic Dunlopillo more cheaply and thus widen the market for our famous product.'

Manufacture

After referring to the fact that the production of polyether foam is a chemical process of a new type for the rubber industry, the article outlines the manufacture of the material as follows:

'The various chemical ingredients are fed into a foaming head which mixes and ejects them in liquid form. The liquid falls into a continuously advancing paper trough and travels down the length of the machine solidifying and eventually emerging expanded into a thick continuous 'loaf,' 16in. or more in height, which is cut off in sections as it emerges. This expansion is achieved by chemical liberation of gas from within the material itself, the heat of the reaction at the same time vulcanizing it. The final changes in the material, to give it its resilience, take place while the 'loaves' are lying stacked after completion of the main process—a very economical way of achieving this.

'The loaves are then cut by specially-designed machinery into the required cushion sizes—and that represents the whole process of manufacture.'

PHILIP SCHIDROWITZ

MEN *and* MATTERS

A Review of People and Events

by George A. Greenwood

AT a notable gathering at the factory of the Michelin Tyre Company the other day, four employees each received a gold watch and a forty-year award emblem to mark long services. The presentations were handed over by the Lord Mayor of the City of Stoke-on-Trent, Alderman H. Clowes, O.B.E., the Lady Mayoress, Miss Christine Clowes, Mr P. Ewen and Mr E. J. Coles, Michelin directors, together with Mr F. Garnier, the general sales manager, in the presence also of the Town Clerk, Mr H. Taylor and Mrs Taylor.

I should add at this point that 29 other employees, three of whom were women, received awards for 25 years' service, and to each of them there was handed a cheque for 25 guineas.

This ceremony is interesting in retrospect for more than one reason. For example, Michelin, outside the trade, is thought of mainly for its French associations. Actually, the company has had an office in London since 1905. Also Stoke is regarded primarily and rightly as the British headquarters of the pottery industry, but Michelins have had a factory there for 33 years. And, to add to it all, a new Michelin factory solely for the production of 'X' steel-cord tyres which is being built at Burnley (Lancs.) is due to come into operation later this year.

And, while still on tyres, the Firestone Tyre and Rubber Co. Ltd. tell me that their new factory is the 46th in the long list of Firestone factories throughout the world. It is situated in Alcochete, 10 miles east of Lisbon, and production capacity is expected to reach 120,000 commercial vehicle and motor car tyres and tubes a year.

New Appointments

I.C.I. Plastics Division announces that Mr J. B. Kitchin has been appointed personnel director in succession to Dr R. G. Hayes, who has combined the responsibilities of personnel and production since 1956, although Dr Hayes remains as production director.

Mr Kitchin, who is probably one of the best-known men on his own side in plastics, is, as his name implies, a Northerner, born at Northwich, in Cheshire, 48 years ago. After being educated locally, he went to St. Andrew's University where he graduated B.Sc. His company career began in 1934 at the Grangemouth Works of the Dyestuffs Division.

He served in several departments before being appointed head of the manufacturing department in 1945. He became assistant works manager in charge of medical and pharmaceutical manufacture in 1951 and, three years later, was assistant works manager in charge of dyestuffs manufacture. In 1955, Mr Kitchin transferred to the Division's Trafford Park Works at Manchester as works manager before moving in the same year to London as deputy head of Central Work Study Department.

Mr Kitchin is married, and has two daughters, the eldest of whom is employed by I.C.I. in the labour department at Billingham Division. Mr Kitchin's hobbies include cooking and riding, training and showing horses.

Obituary

Mr Herbert J. Stone, who died recently, was connected with the cable industry for a long time and was best known as a director and general manager of British Insulated Callender's Cables, but he was also chairman of British Insulated Callender's (Export). He was, too, deputy chairman, both of the British Insulated Callender's Construction Company and British Insulated Callender's (Submarine Cables). He served in a similar capacity in British Copper Refiners.

Mr W. A. Shaw, who died suddenly recently, must have been one of the oldest serving men in any section of the industry. He joined the staff of Morris Ashby Ltd., with its national and international connexions, 51 years ago, and he had been for many years the company's Glasgow area manager, as well as that of its associate company, Columbian International (GB) Ltd.

Like Mr Stone he will be much missed by a great many friends in the industry.

More Enterprise

More and more rubber and plastic food handling materials and products are being called upon on both sides of the Atlantic to meet the most up-to-date requirements. A message from Akron, Ohio, says that to deal with the severe requirements of the Food and Drug Administration's new 'food additive' amendment, the B. F. Goodrich Industrial Products Co. is producing a series of conveyor belts, brewery hose and milking inflations.

This company, by the way—a division of the B. F. Goodrich Co.—is

The staff dinner and dance of the Ship Carbon Co. of Great Britain Ltd. was held at Ilford on March 4. Among those present were *(left to right)* **H. O. Rippe, works manager, Mrs J. S. Woods, J. S. Woods, managing director, Mrs J. H. Jewel, J. H. Jewel, sales manager**

said to be the first in the rubber industry to receive the Food and Drug Administration's approval for sale after the new amendments dealing with products manufactured specifically for use in the food processing industry. Thousands of experiments have been conducted to determine the exact materials used in manufacturing rubber products that may 'migrate' into food.

850 Go Gay

From a friend I have been hearing of the gaieties of the annual staff dance held by the London Rubber Co. Ltd. (Manufacturing Division), of Chingford, E.4, who, with their friends, gathered at the Assembly Hall, Walthamstow. In addition to executive and other members of the managerial staff, Mr A. R. Reid and Mr F. L. Davies (directors) were also present. Dancing to the music of Charles Ernesco's orchestra continued until midnight, and Barry Manning's 'Champagne' Cabaret gave a show during the evening.

Harry Willshaw

The farewell dinner to Dunlop's Harry Willshaw will be held at the Savoy Hotel on Tuesday evening, March 15, and not on March 16, as stated in the February 27 issue of *RJIP*.

RABRM Dinner Dance

The annual dinner dance of the Research Association of British Rubber Manufacturers was held at the Lion Hotel, Shrewsbury, on February 19. The staff of the RABRM was well represented and there was also a large attendance of members and friends. Speeches were made by Mr A. E. Eagles on behalf of the Sports and Social Club and by Dr H. A. Daynes representing the guests. Dancing continued until a late hour and the event was judged to be the most successful so far held.

Monsanto Move

I hear that at a recent meeting of the board Mr J. M. Kershaw, director of development and market research, was appointed alternate to Mr T. P. Berington on the board of Monsanto Chemicals Ltd.

Mr Kershaw, who joined Monsanto in 1946, has been responsible for a number of special development projects, including the construction of the company's new factory at Fawley. Before his appointment as director of development and market research he was chief engineer of the company.

NCB Regrets

An official announcement says that the Minister of Power has accepted with regret the resignation from the National Coal Board of Mr S. P. Chambers, who has felt obliged to resign because of his increased business commitments. Mr Chambers, who became deputy chairman of Imperial Chemical Industries in 1952, took over the chairmanship of I.C.I. last week.

A Plastics M.P.?

It is a very reasonable assumption that in the bye-election at Harrow West which will be determined next Thursday, the House of Commons will be reinforced by a working executive of the plastics industry, for Mr Jack Page, 40, sales manager of Long and Hambly Ltd., manufacturers, is one of the contestants. He contested, in what then seemed to be a sort of cavalier fashion, the Eton and Slough division at the last General Election against the redoubtable Mr Fenner Brockway, whose majority he reduced from 2,443 to 225.

In Harrow, of course, he is faced with quite a different cup of tea for the late Sir Albert Braithwaite, had in 1959, a majority of something like 18,000. One of Mr Page's prior slogans is the abolition of the Schedule A property tax.

Shell Appointments

Amongst a number of new appointments announced this week by Shell's Plastics Division, the most important has been R. E. McOnie's move from marketing manager to take up a senior

S. W. FARRINGTON R. E. McONIE

appointment with Shell Chemical Australia (Pty.) Ltd. S. W. Farrington, present manager of the Polystyrene/PVC Department, takes his place. The appointments become effective in May.

Solvents and Resins

Another Shell change is that Mr A. G. S. Reid has been appointed solvents and resins sales manager in the Southern sales region, with effect from the beginning of the month. He takes over from Mr M. B. Creed, who is assuming a senior appointment about which, I gather, we shall hear more later.

Mr Reid saw war service with the Argyll and Sutherland Highlanders, being awarded the Military Cross, and joined the Shell Group in 1947. During his service with the company he has been a representative with the Scottish and Southern Sales Regions, being responsible for solvents, resins, detergents and agricultural products. Prior to his present appointment he served in an administrative capacity in the head office for four years.

Mr R. Turner, acting managing director of Powell Duffryn Technical Services has joined the Board of Powell Duffryn Carbon Products as deputy chairman. Mr F. W. Stokes, a director of Powell Duffryn Carbon and works manager of the company's factory at Hayes, has been appointed general manager. Mr Barrie Heath, managing director of Powell Duffryn Carbon Products and a director of other companies in the Powell Duffryn group, has relinquished these appointments to take up another post.

Some of those at the RABRM dinner dance *(left to right)*: **Dr W. F. Watson, Mrs Daynes, Dr H. J. Stern, Dr H. A. Daynes, Mr A. E. Eagles, Mrs Watson, Mrs Wake, Dr W. C. Wake, Mr R. C. Moakes, Mrs Moakes**

Rating of Plant and Machinery

REVISED LIST IN FORCE ON APRIL 1

MR HENRY BROOKE, Minister of Housing and Local Government, has laid before Parliament an order which comes into force on April 1, containing a revised list of plant and machinery liable for rates. It applies to England and Wales and consists, with modifications, of the list recommended by the committee under the chairmanship of Sir Edward Ritson which was appointed at the end of 1957.

The principles of rating plant and machinery were established in the Rating and Valuation Act of 1925. This Act set out four classes of plant and machinery liable for rates:

1. Items for—
   (a) the generation, storage, primary transformation or main transmission of power; or
   (b) heating, lighting, ventilating, etc.
2. Passenger lifts and elevators.
3. Railway and tramway lines and tracks.
4. Any plant which is ' in the nature of a building or structure.'

The Act required a committee to list in detail the types of plant and machinery affected, and empowered the Minister to confirm the list by means of an order which, if not disapproved by Parliament, would be the decisive test of liability for rates. An order issued in 1927 is still in force, and the Ritson Committee was set up to review the list.

The New Order

In Class 1 the Minister has accepted the recommendation that less electrical apparatus should be rated under the heading of ' main transmission of power,' so as to bring it into line with the rating of other forms of power, but he has simplified the wording put forward by the Committee. He has reworded a formula clarifying the exemption of ancillary apparatus from Class 4 to bring out the fact that a part of an item of rateable plant is not rateable unless it forms an integral part of the structure of the plant.

The main work of the Committee in Class 4 was to list the plant and machinery of a structural nature which was not in the 1927 Order. Their additions to the list reflect the development of technology in the past 30 years by naming items like nuclear reactors, radar and television masts and wind tunnels. Some of their other additions, however, such as boilers and main pipelines, were in existence in 1927, and these last two items have given rise to strong protests. Some objectors have argued that, as a matter of law, boilers cannot be named in Class 4. The legal advice given to the Minister is that boilers can and should be included, and they accordingly appear in the order.

A difficulty of a more practical nature arises on ' main pipelines.' In the past the valuation authorities have relied on the items ' flumes and conduits ' which appear in the 1927 order. This title is not very apt, and the addition of the words ' main pipelines ' might have been expected to remove doubts. The Minister agrees that the expression ' main pipelines ' might prove to be wider than was expected, and might lead to the rating of pipes of a kind not intended by Parliament in 1925. The Minister has therefore left this item out of the order, and the liability of pipelines for rates remains as at present.

The Ritson Committee were not entirely unanimous. Two issues were subject to majority recommendations only of the Committee: that all plant and machinery which moves or rotates should be exempted from Class 4 (the suggested exemption cannot be granted), and that plant of less than certain dimensions which in ordinary business practice is moved about, should not be rateable in Class 4. The Minister accepts this proposal in principle, but has been advised that there is no power to put it into effect under the existing law. He has announced his willingness to consider a suitable amendment of the law when an opportunity occurs.

The order was subject to annulment within 40 days by resolution of either House.

Question Corner—108

(Second Series)

433. What is the process known as rotational moulding?

(Answer next week)

Answer to Question Corner—107

432. Polyvinyl butyral can be produced either by reaction of butyraldehyde with polyvinyl alcohol, or by direct reaction of the aldehyde with polyvinyl acetate.

Commercially, however, polymerization of vinyl acetate, the alcoholysis of the polyvinyl acetate and the condensation of the polyvinyl alcohol with butyraldehyde are carried out in separate batch operations.

After the polyvinyl butyral has been formed it is precipitated by a non-solvent (*e.g.* water) and then purified and stabilized with such materials as inorganic alkalis or tertiary amines (USP 2,122,277). This is to prevent changes in viscosity and discoloration on ageing and exposure to sunlight.

In another patent, stabilization is achieved by treating the freshly-formed precipitate of polyvinyl butyral. The suspended polymer is agitated with water containing a small percentage of urea and potassium hydroxide to bring the *p*H to 10.5. This agitation is continued for three hours at about 80°C. to permit complete penetration of the particles. Additional alkali is added to maintain the *p*H at 10.5 (USP 2,282,026). Dimethyl dibenzyl ammonium hydroxide has been used (USP 2,378,619).

The dried material is then ground, softened on hot rolls and compounded with plasticizers and, if required, fillers and pigments. For the manufacture of safety glass only plasticizer and solvent is added.

(Another question next week)

'Cold flow — a runny nose'

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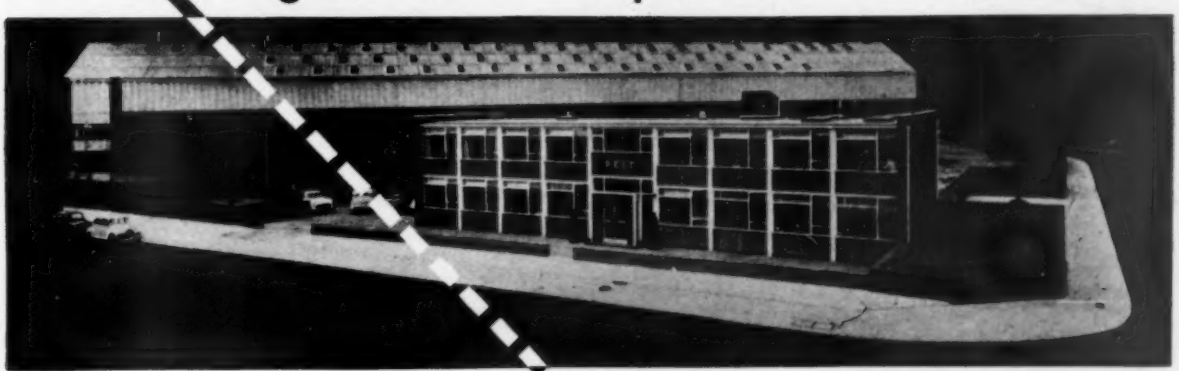

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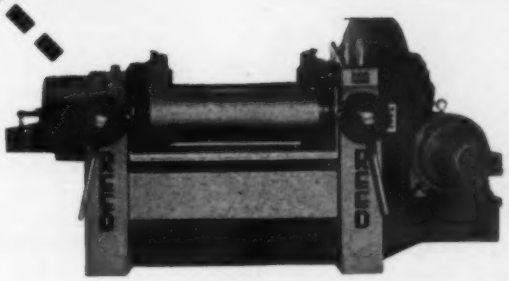

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Rubber Statistics

UNITED KINGDOM — VIETNAM — BELGIAN CONGO

DETAILS are now available of the consumption and stock figures for the UK up to the end of last year.

During December, 17,012 tons of natural rubber were consumed, the weekly average during December running at 3,402 tons. December consumption brought the year's consumption total to 180,642 tons, an increase of rather more than 5,000 tons compared with 1958, though almost exactly 1,000 tons less than the 1957 figure.

The December consumption figure of 2,647 tons for natural rubber latex brought the year's total to 27,022 tons, nearly 1,000 tons more than the previous year's figure.

Stocks of natural rubber at the turn of the year amounted to 23,620 tons, of which 7,750 tons were held in warehouses and 15,870 tons were held by manufacturers. Included in these stocks were 4,788 tons of latex.

The December consumption figure for synthetic rubber was 8,656 tons, giving a weekly average of 1,731 tons. Total consumption during the year amounted to 79,013 tons, an increase of 16,000 tons or some 25% compared with 1958. Stocks of synthetic held at the end of the year stood at 11,112 tons, having fallen during the course of the year by about 3,000 tons.

Consumption of reclaim during December, at 3,191 tons, brought the year's total to 35,643 tons, an increase of some 2,000 tons compared with the previous year.

Vietnam

Details now made available show that Vietnam's rubber exports during 1959 amounted to 72,273 tons, an increase of nearly 5,000 tons over the 1958 total. Of this amount 48,154 tons consisted of smoked sheet, 20,776 tons of crepe and cuttings, and 2,896 tons of latex (dry rubber content).

The main customer for this rubber was France, taking 29,877 tons, and the second most important consumer was Western Germany, which took 18,943 tons. Apart from these two countries, the USA took 8,624 tons, the UK 2,684 tons, Singapore 3,385 tons, Belgium 2,343 tons, Italy 2,750 tons, and the Netherlands 2,358 tons.

Belgian Congo

Exports from the Belgian Congo during the third quarter of 1959 amounted to 9,328 tons, and brought the total to the end of September to 28,028 tons. Of this amount, the USA received 10,456 tons, while 7,197 tons went to Belgium. Other countries to take rubber from the Belgian Congo during these months included France (4,561 tons), the Netherlands (2,176 tons) and Western Germany (1,535 tons).

Sole Crepe

Exports of sole crepe during December brought Malaya's sole crepe exports for the year to 8,572 tons, including 1,902 tons of cuttings. In 1958, sole crepe exports from Malaya had amounted to 9,925 tons and in 1957 to 17,398 tons. These figures reflect the steady fall in demand for what was once a fairly popular shoe-soling material. The largest consumer of this rubber remained the UK which took 3,783 tons, and was followed by France with 971 tons and Spain with 713 tons. Other important markets included Italy (431 tons), Hong Kong (376 tons) and Japan (396 tons).

Ceylon's sole crepe exports in 1959 amounted to 910 tons or 37 tons less than the previous year. Of this quantity, 228 tons went to the UK and 221 tons to France. The next most important customer was Pakistan, taking 82 tons. Exports of sole crepe from Cambodia amounted to 237 tons during the year; all but 10 tons were taken by France.

John Ryan, vice-chairman of the Metal Box Co., has been presented with the gold medal of the International Committee for Scientific Management in Melbourne. He was selected from managers from 29 countries.

Plastics Statistics

JANUARY IMPORTS AND EXPORTS

THE official Trade and Navigation accounts for January 1960 show that UK imports of plastics materials during the month amounted to 7,516 tons, compared with 3,686 tons in January 1959. The values were £2,389,307 and £1,320,073.

USA was the major source, supplying 3,178 tons worth £1,176,398—almost double the amount she supplied for January last year—followed by Western Germany with 1,520 tons (£511,322).

Exports of plastics materials during January totalled 14,520 tons valued at £3,874,213. 1959 figures were 11,617 tons and £2,980,484. Of the month's total Hong Kong took 1,553 tons worth £386,676; South Africa 1,025 tons—£222,224; Sweden 1,015 tons—£270,521; and Australia 856 tons—£295,455.

Details of imports of plastics materials during January 1960 are as follows:

	Tons	£
Alkyd solid and liquid resins, solutions, emulsions and dispersions	225	45,801
Cellulose plastics:		
Photographic (including cinematograph) film base (except acetate butyrate)	166	216,942
All other	266	236,134
Polyvinyl chloride:		
Polymers and copolymers	2,634	409,341
All other	565	224,913
All other	3,660	1,256,176
Total	7,516	2,389,307

Exports of plastics materials during January 1960:

	Tons	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	525	330,577
Alkyd solid and liquid resins, solutions, emulsions and dispersions	459	91,898
Aminoplastics:		
Solid and liquid resins, including solutions	691	87,584
Moulding and extrusion compounds	669	125,297
Cellulose plastics:		
Moulding and extrusion compounds	282	84,266
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	113	75,522
Phenolics and cresylics:		
Solid and liquid resins (straight and modified)	749	179,914
Other	684	268,709
Polystyrene	860	194,986
Polythene (polyethylene) sheet, rod, tube, film, foil and profile shapes in primary form	269	101,501
Polyvinyl chloride:		
Polymers and copolymers	1,275	179,590
Moulding and extrusion compounds	773	170,135
Sheet	717	304,469
Other	65	15,877
All other	5,739	1,593,986
Waste and scrap (including celluloid and film waste and scrap)	650	69,902
Total	14,520	3,874,213

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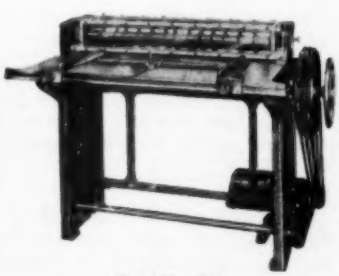

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PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Bonding Rubber to Metal

No. 822,725. Lord Manufacturing Co. Application and Filed, April 24 1956. Application in USA, April 29 1955. Published, October 28 1959.

An adhesive composition for bonding natural and synthetic rubber to metal comprises a mixture of (1) a material which adheres to metal, *e.g.* chlorinated natural rubber, and (2) a mono- or poly-C-nitroso aromatic compound. Preferably the mixture contains also a vulcanizable polyolefin, such as a polychlorobutadiene or an after-brominated polychlorobutadiene. Numerous suitable mono- and poly-C-nitroso aromatic compounds are listed. The adhesive is applied between the metal and the unvulcanized rubber and the assembly heat-vulcanized under pressure.

Several examples of adhesive compositions are given. In the first example, the adhesive composition consisted of 10 parts of N,4 dinitrosodiphenylamine, 30 parts of after-brominated poly-2,3-dichlorobutadiene and 70 parts of chlorinated natural rubber. The mixture was dissolved in toluene, applied to a steel surface and allowed to dry. A sheet of unvulcanized natural rubber compound was applied to the adhesive-coated surface and the assembly heat-vulcanized under pressure to produce test piece *A*. Test piece *B* was prepared in the same way from a mixture without the nitroso compound. Test piece *A* had an adhesion strength of 40lb. per inch and tore substantially into the body of the rubber, whereas test piece *B* had an adhesion strength of less than 20lb. per inch.

Non-woven Leather-like Sheet Material

No. 823,962. E. I. du Pont de Nemours and Co. Application and Filed, June 18 1956. Application in USA, July 27 1955. Published, November 18 1959.

A leather-like sheet material is formed from a number of layers of matted structural fibres, the length of the fibres in one or more surface layers being 0.005-0.015in. and the length of the fibres in the other layers being 0.01-8in. or more. The fibres in the layers are bonded together with an extensible polymeric binder which serves also to bond together the adjacent layers. Some or all of the fibres in the surface layer are raised so as to give a suede-like surface to the material. Optionally, fine channels may be formed in the sheet material to render it vapour-permeable. Various polymeric materials which may be used as binders are listed; they include butadiene-styrene copolymers, polythene, polyisoprene, PVC and many other polymers.

Vinyl Chloride Polymer Compositions

No. 824,200. Imperial Chemical Industries Ltd. Inventor: K. B. Jarrett. Application, December 20 1956. Filed, December 4 1957. Published, November 25 1959.

Resorcinal and formaldehyde are added to PVC latex, made by emulsion polymerization of vinyl chloride, and the mixture is heated to form a coating of resorcinol-formaldehyde resin on the surface of the particles of PVC in the latex. Instead of resorcinol, melamine or other compounds which will react with formaldehyde to form a thermosetting resin may be used. The treated PVC latex may be mixed with latices of natural or synthetic rubber or other polymers. In examples, the treated PVC latex was mixed with (a) butadiene-acrylonitrile copolymer latex and (b) untreated PVC latex. Water may be removed by coagulating and drying the treated PVC latex or latex mixture.

The tensile strength and other properties of natural and synthetic rubbers, particularly butadiene-acrylonitrile copolymer, are improved by the presence of the treated PVC, while the impact strength of untreated PVC is improved by the addition of the treated PVC. The treated PVC has good chemical and heat resistance, good electrical properties and good external weathering properties.

Shorter Abstracts

Stabilized Polypropylene. 820,967. Imperial Chemical Industries Ltd. Filed, October 30 1957.—Isotactic polypropylene is stabilized against deterioration by air and light or heat by incorporating a small amount of a substituted *p*-phenylene diamine in the polymer.

Polymerization Initiators. 820,675. Farbenfabriken Bayer AG. Filed, June 20 1957.—Boron trialkyls are claimed as initiators for the polymerization of vinyl and vinylidene compounds.

Link Mats. 821,022. Nuway Manufacturing Co. Ltd. Filed, March 23 1956.—Some or all of the links of a link mat are provided with a pile surface on both faces. The link mats are of the kind built up from strips of rubberized fabric cut, for example, from discarded tyres.

COMPANIES in the NEWS

BTR Improve Position

'The results of the last financial year are disappointing,' says Sir Graham Hayman, Chairman of BTR Industries, in a statement to shareholders which has been circulated before the annual general meeting, due to take place on March 29. But, Sir Graham adds, the immediate results of the heavy reconstruction and expansion programme have placed the group in a stronger position to meet the competitive conditions which must be expected in the future.

'If present trade trends continue, there should be improved earnings from our traditional or established activities, and some of the newer developments may be expected to contribute usefully to the group profit,' Sir Graham says.

As announced earlier, group net profit for 1958-59 fell from £348,120 to £328,953, after a substantially reduced tax charge, and the dividend is reduced by 2½% to 12½%.

Sir Graham refers to the high price of natural rubber and says that, where it has been possible to use synthetic without reducing quality, this has been done, but the field where this practice can be followed is limited.

The decline in coal consumption has meant a decrease in orders for conveyor belting from the National Coal Board, he indicates. But despite the narrower profit margins on PVC and rubber belting he is confident that the firm's position is being maintained.

Divisions that Sir Graham mentions as doing well include the hose division, which has steadily secured substantial and expanding sales of high pressure hose units through its marketing company, Oil Feed Engineering Company, and the newly-acquired Microcell group. Glass Yarns and Deeside Fabrics, a member of this group, have been unable to meet demand, and steps have been taken to treble production.

Columbian Carbon Result

Columbian Carbon Company in an interim report state that unaudited figures indicate net earnings from operations for the year 1959 at $6,908,000 or $4.28 a share, up 93% from 1958 net earnings of $3,966,000 or $2.22 a share. Total sales and other income for 1959 amounted to $76,838,000 compared with $65,957,000 for 1958, an increase of 16%. Both 1959 sales and earnings figures established new records for the company.

Callaghan and Son Ltd., makers of fibre opening and amalgamating machines, have moved to Pytchley House, South Street, Midhurst, Sussex. Works and research departments have moved to Midhurst Works, Liss, Hampshire.

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THERE has been plenty of excitement in the stock market over the past few weeks, but generally speaking share prices have steered an irregular course. The Account, which was also the last of the Stock Financial Year, closed last Friday on rather an unspectacular note.

Main reason for this is investors' anxiety about the outlook for Government Gilt-Edged stocks; since the Government officially disclosed that they were not prepared to continue to support this particular section of the market, stocks had shed something like £160m. plus in values. This development, which rocked the parish of Throgmorton Street, more than offset the good news from the boardrooms, the satisfactory gold reserve showing and the announcement of record production for January.

Many brokers and jobbers have said that they have had one of their quietest sessions since the year began. The number of bargains 'marked' has fallen to an average of less than 14,000 a day—a great way off the 32,000 recorded on the day after the share index hit its new 'high' of 342.9 on January 4. The falling volume of business as shares have drifted suggests, however, that selling may have now become a spent force. We consider that prices are not likely to go very much lower; on the other hand we cannot see them rising very much at the present.

For many of the big industrial giants the dividend season has arrived, and later this month IMPERIAL CHEMICAL INDUSTRIES, one of the largest of them all, is expected to report to shareholders. Already investors are forecasting brilliant results and are anticipating that the dividend will be increased. So the shares of the company have been one of the bright exceptions to the general trend, and, since they last appeared in this column, have improved to 61s. 3d. If the MONSANTO CHEMICALS trading figures are used as a yardstick, this support should prove to be well justified. This group's net profits have soared from £1,016,300 to £1,693,300, and the dividend has been raised 1¼% to 15%.

Sales of the parent company increased to a record £18,427,500. They compared with the previous year's total of £15,426,600. Chairman Sir Miles Thomas said that the improvement in the volume of sales, which he had referred to last August, continued during the second half at even greater momentum. Direct export business accounted for 37% of total sales, a contribution of £6,877,980 to the turnover.

The year saw notable expansion of operations: in particular the £3½ million polythene plant at Fawley which was completed to plan and went on stream smoothly. Reason for the small increase in the dividend may be due to the fact that the group still has large expansion plans. It was last reported that these should cost another £2m. but, of course, they may be larger now.

The price of the shares had already

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Share Price Movements

Par Value	Company	1959-60 High	Low	Feb. 27	Latest
£1	A.E. Ind. Ord.	67/6	53/9	60/6	58/6
5/-	Albright & W. Ord.	31/-	13/4½	28/3	28/6
£1	" " " 5% Pref.	18/9	15/4½	16/10½	17/3
5/-	Anchor Chemical Ord.	27/6	10/3	27/-	26/-
5/-	Andersons Rub. Ord.	4/6	1/1½	3/1½	3/1½
£1	Angus Geo. Ord.	44/6	25/3	42/6	41/3
5/-	Ault & Wiborg Ord.	24/-	11/6	21/10½	21/-
£1	Avon India Rubber Ord.	47/6	35/6	40/-	40/-
£1	" " " 6% Pref.	18/6	16/6	17/6	18/9
10/-	Bakelite Ord.	46/3	22/-	43/9	42/6
£1	" 6% Pref.	19/6	17/6	18/3	18/9
£1	Baker Perkins Ord.	53/9	41/3	51/-	51/-
4/-	Bank Bdg. Rubber Ord.	3/7½	1/6	3/6	3/6
5/-	Boake (A) Roberts Ord.	29/6	12/3	29/3	30/3
£1	" " " 5% Pref.	16/9	13/9	16/3	16/3
4/-	Brammer H. Ord.	17/6	9/6	17/6	18/3
10/-	Bridge, David Ord.	58/-	24/3	53/9	55/-
5/-	Bright, John Ord.	18/9	9/6	16/6	16/3
2/-	Brit. Ind. Plas. Ord.	13/6	6/9	14/-	13/9
2/-	" 10% (tax free) Pref.	4/9	3/-	4/9	4/9
£1	British Xylonite Ord.	87/6	46/-	85/-	86/-
£1	" " 5% Pref.	16/9	15/-	16/9	
£1	BICC Ord.	61/-	44/6	56/-	53/-
5/-	BTR Ind. Ord.	13/3	8/1½	12/6	12/6
£1	" " 7½% Pref.	24/3	20/9	23/9	23/9
£1	Courtaulds Ord.	67/9	20/-	62/1½	62/4½
£1	" 5% 1st Pref.	18/9	15/7½	17/9	17/6
£1	" 6% 2nd Pref.	22/6	19/-	20/6	20/4½
4/-	Cow, P. B. Ord.	8/3	6/6	8/3	8/-
£1	" " 5% Pref.	15/6	12/6	15/6	15/6
1/-	Dannimac Mfg. Ord.	11/6	5/2	11/3	10/6
10/-	De La Rue Ord.	73/9	42/9	72/3	71/-
£1	" " " 3½% Pref.	12/9	10/6	11/9	11/9
10/-	Distillers Co. Ord.	39/6	23/6	35/-	34/4½
£1	" " 6% Pref.	23/-	19/6	21/6	21/3
£100	" 5% Conv. Loan	£97	£92	£96	£97
£100	" 5½% Unsec. Loan	£98½	£90	£94	£93½
10/-	Dunlop Rubber Ord.	29/9	17/-	25/1½	24/4½
£1	" " 5½% Pref.	20/3	16/3	18/3	18/-
£100	" 3½% 1st Debs.	£78	£71½	£76	£76
£100	" 4½% 2nd Debs.	£88	£80½	£86	£86
£1	Eng. Elect. Ord.	61/-	37/9	47/9	41/6XD
4/-	Ebonite Cont. Ord.	15/3	11/-	12/6	12/6
£1	English China Clays Ord.	94/3	47/-	91/6	91/10½
£1	Goodyear Tyre 4% Pref.	13/-	11/9	12/6	12/-
5/-	Greeff Chem. Ord.	31/9	15/-	30/3	32/6
10/-	Greeff Chem. 5½% Pref.	8/9	7/6	8/9	8/9
5/-	Hackbridge Hldg.	19/9	14/-	16/-	15/3
4/-	Greengate & Irwell Ord.	7/-	4/-	5/9	5/9
£1	Harrisons & Crosfield Dd.	64/-	30/9	56/3†	55/7½
1/-	Hunt & Moscrop Ord.	2/6	1/1½	2/1½	2/4½
£1	Imp. Chem. Ord.	62/6	32/9	57/10½	61/3
£1	" " 5% Pref.	19/-	15/6	17/9	17/6
£100	" 4½% Unsec. Loan	£90½	£84	£88	£89
£100	" 5½% Conv. Loan	£196½	£178	£178	£193
1/-	Kleemann (O. & M.) Ord.	10/3	4/3	9/9	9/3
£1	" " 6½% Pref.	19/-	14/-	18/1½	18/9
2/-	Lacrinoid Prod. Ord.	4/3	1/5½	3/3	3/9
5/-	Laporte Ind. Ord.	31/-	19/3	25/6	26/9
£1	" " 7½% Pref.	24/3	21/10½	23/9	23/9
£1	Leyland & Birm. Rubber Ord.	59/-	39/9	52/6	51/10½
£1	" " " 6% Pref.	19/-	17/-	18/9	17/-
2/-	London Rubber	14/9	6/3	12/9*	12/1½
£1	" 6% Red. Cum. Pref.	20/-	16/3	18/9	18/9
£1	McKechnie Bros. Ord.	71/3	39/3	66/3	67/6
£1	" " 'A' Ord.	67/6	38/9	65/-	65/-
£1	" " 6% Cum. Pref.	17/-	16/-	17/-*	17/-
5/-	Monsanto Chem. Ord.	27/9	14/9	24/-	24/6
£1	" " 3½% Pref.	13/6	12/-	12/6	13/-
£100	" " 6% Debs.	£104½	£101	£104	£104
£1	North British Rubber	21/3	15/7½	20/3	20/3
5/-	Plastic Enginrs. Ord.	26/9	10/3	26/9	27/-
5/-	Redfern Holdings Ord.	7/-	2/6	4/9	4/9
2/-	RFD Ltd. Ord.	6/9	4/-	6/-	6/-
£1	" " 5½% Pref.	16/6	12/-	13/9	13/9
2/-	Rubber Imp. Ord.	10/9	4/-	6/7½	6/7½
2/-	" " 'A' Ord.	10/3	3/6	5/7½	5/4½
£1	" " 5% 1st Pref.	13/3	10/-	13/3	13/1½
5/-	Rubber Reg. Ord.	19/-	10/-	18/3	18/9
4/-	Shaw Francis Ord.	25/-	13/6	25/-	24/6
2/-	Silentbloc Ord.	13/-	7/6	11/-	10/-
2/-	Sussex Rubber Ord.	2/1	1/3	1/7½	1/7½
5/-	Sutcliffe Speak Ord.	13/-	6/3	12/-	12/-
£1	Turner & Newall Ord.	113/9	68/6	111/9	111/6
£1	" " " 7% Pref.	25/6	22/6	24/3	24/-
5/-	Universal Asbestos Ord.	43/-	14/3	41/-	40/-
5/-	Viscose Dev. Ord.	15/-	9/-	15/-	15/-
5/-	Warne William (Holdgs.) Ord.	19/3	10/9	18/1½	18/-

*Ex-dividend †Ex-capitalization

Rubber Markets

LONDON

The recent improvement in prices in the London rubber market has been fully maintained during the week but there has been little further change. Trading has been quiet and interest has been at a low level. The underlying firmness of the market reflects confidence in the outlook for the commodity.

Latest prices are as follows:

No. 1 RSS Spot: 34⅜d.-34⅝d.

Settlement House:

April 34⅛d.-34⅜d.

April/June 34⅛d.-34⅜d.

July/September 33⅛d.-33⅜d.

October/December 32⅛d.-32⅜d.

January/March 32d.-32⅛d.

No. 1 RSS cif basis ports:

March 34⅛d.-34⅜d.

April 34⅛d.-34⅜d.

Godown:

March 118½ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, March, seller 20s. 6d., cif European ports, Spot, 20s. 9d. Bulk, seller, 19s. 9d. Creamed, seller, March, 20s. Normal, seller, March, 15s. 7d.

NEW YORK

The New York rubber market ruled as under on March 7:

DEALERS' PRICES

	US cents per lb., ex-dock	
	March 7	Previous
No. 1 RSS, March	40¼a	40¼a
April	39¼a	40a
No. 2 RSS, March	40¼a	40¼a
April	39¼a	39¼a
No. 3 RSS, March	40¼a	40¼a
April	39¼a	39¼a
No. 1 RSS, Spot	40¼a	40¼a
No. 3 amber blanket crepe, May	39¼n	39¼n
No. 1 latex thin crepe, March	44¼n	44¼n
No. 1 latex thick crepe, March	Unq.	42¼n

FUTURES—REX CONTRACT

	Closing	Prev. Close
March	39.80b–40.25a	40.40b–40.45a
May	39.20b–39.30a	39.50b–39.60a
July	38.30t	38.60b–38.75a
September	37.75b–37.95a	38.10b–38.30a
November	37.25b–37.50a	37.55b–37.85a
January	36.95b–37.20a	37.10b–37.40a
March	36.60b–36.85a	36.60b–36.90a

Sales: 44. Tone: Easier

Rubber futures were steady in a meagre trading volume. Traders said that interest in futures and physical rubber on March 7 was slow. Physical rubber was steady but quiet and featureless.

Futures eased later in the day in a light flurry of selling influenced by the GSA announcement. Informed trade sources expressed the opinion that the GSA would sell no more than a total of 75,000 tons for the entire fiscal year.

SINGAPORE

The market ruled very quiet and fluctuated within very narrow limits during the morning of March 7. There was small interest in lower sheets. The preliminary February rubber export figure of 87,776 tons (January 101,218 tons) had no effect on the market. In the afternoon, prices steadied slightly on rumours of a Chinese order. Transactions were limited and the market finished quiet. Factories were quiet. Lower sheets were neglected.

	Malayan cents per lb., fob Malayan ports to open ports	
	March 7	Previous Close
No. 1 RSS, March	117¼–117½	117½–117¾
April	117¼–117½	117½–117¾
No. 2 RSS, March	115½–115¾	116 –116¼
No. 3 RSS, March	114¼–114½	114¼–115¼
No. 4 RSS, March	113¾–114¼	114 –114¼
No. 5 RSS, March	110¼–111¼	111¼–112¼
No. 1 Spot	116¼–117¼	117¼–117½
No. 3 blanket, thick re-milled, March	113 –115	113¼–115¼
No. 1 fine pale crepe, March	133¼–135½	133½–135½
2X thin brown crepe, March	112½–113½	112½–113½

Tendency: Quiet

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums fob at 205.80d. per gallon.

The Singapore Chamber of Commerce Rubber Association has instituted a new system of fixing the official noon and closing (16.30) prices. Hitherto, official prices have been issued only for No. 1 RSS. Henceforth, official prices will be issued for Nos. 1 to 5 RSS inclusive, including No. 1 RSS spot.

Under the new system, the Association's secretaries will call for prices daily from any three members of a panel of brokers and dealers. The secretaries will then average out the prices received and in case of any discrepancies approach other members of the panel. Previously, the official prices were fixed by a sub-committee comprising two dealers and one broker who remained constant.

The Association considers the new procedure more representative and believe it should obviate any criticism which may have been levelled against the former system.

As well as the official prices for open port destinations, official prices will also be issued at 16.30 local time for RSS Nos. 2 to 5 for shipment to UK/Continent destinations.

AMSTERDAM

The Amsterdam rubber market ruled as under on March 7:

	Guilders per kilo	
No. 1 RMA	March 7	Previous
March	3.34	3.34
April	3.31	3.31
May	3.31	3.31
June	3.31	3.31
April/June	3.31	3.31
July	3.19	3.19

Sales: Nil Tendency: Quiet

DJAKARTA

Two tons of sheet No. 1 were sold at 40 rupiahs per kilo on March 7. Demand was small and prices were below last week's levels. The market closed very quiet.

	Rupiahs per kilo	
	March 7	Previous
Spot No. 1 Priok	38.50b	39.00n
Spot No. 2 Priok	37.50b	38.00n
Spot No. 3 Priok	36.50b	37.00n
No. 1 fine pale crepe, spot	38.50b	39.00n

Tendency: Very quiet

BANGKOK

No. 1 RSS

The price for No. 1 RSS at Bangkok on March 7 was 37.75 (37.50) US cents per lb.

CEYLON

No. 1 RSS

The price for No. 1 RSS Spot at Colombo on March 7 was 135.5 Ceylon cents per lb.

Cooper and Volcrepe

Cooper and Co. (Birmingham) Ltd., felt manufacturers, of Brynmawr, are to acquire a 50% interest in Volcrepe Ltd., it is reported, who concurrently will increase their issued capital from £130,000 to £195,000.

Volcrepe, whose chairman is W. T. L. Becker, manufacture a wide range of rubber and synthetic products, including shoe soling materials, latex foam, and polyether and polyester foams. Cooper and Co. have been established over 100 years and are manufacturers of high-grade felts and felt fabrication. They are suppliers of precision felt components to the car industry and all branches of the engineering trade. They have new factories at Brynmawr and at Greet, Birmingham. E. F. Bensly, chairman of Cooper and Co., together with N. W. Hailey and C. A. Lee, will join the board of Volcrepe.

Mr J. C. Givan has been appointed a director of Seafield Amalgamated Rubber Company.

'NEW POLYMERS'

The Rubber Chemistry Division of The Chemical Institute of Canada has scheduled a symposium for April 8 1960 at the Walper House, Kitchener, Ontario, on the theme of 'New Polymers.'

The following papers are to be presented:

'Advances in Sillicone Rubber Polymers and Compounding'—C. W. Roush, project leader, silastic division laboratories, Dow-Corning Corporation, Midland, Mich., and A. M. Dunlop, technical representative, Dow-Corning Canada Ltd., to be read by Mr Dunlop.

'Polyurethane Elastomers' — M. Borr, research laboratories, Dominion Rubber Co. Ltd., Guelph, Ont.

'Rheological Measurements on Elastomers with the Brabender Plastograph'—Dr McCabe, elastomers division, E. I. du Pont de Nemours and Co. Inc., Wilmington, Del.

'Improved Synthetic Rubbers for the Modern Tire'—T. A. Riehl, manager, product development compounding, Goodyear Tire and Rubber Co. Inc., Akron, Ont.

'Measurement of Dispersion of Carbon Black in Rubber'—A. I. Medalia, research laboratories, Godfrey L. Cabot Inc., Cambridge, Mass.

'Antiozonant Blends and Their Testing'—J. Payne, Monsanto Chemical Company, London, England.

'Dynamic Mechanical Properties of Some New Elastomers'—A. D. Dingle, Dunlop Research Centre, Toronto, Ont.

'Determination of Physical Properties of a 5 gram. Sample of Rubber'—J. Briggs, E. Kent, W. Embree and W. H. Watson, Polymer Corp. Ltd. To be read by Mr Watson.

Pre-registration forms may be obtained from Wray A. Cline, Canadian General Tower Ltd., 52 Middleton Street, Galt, Ont.

STOCK MARKET

Continued from page 403

discounted these splendid results and that is why our price list shows only a modest improvement in the quotation.

Better than expected figures arrived from the ALBRIGHT AND WILSON group. Trading profits have expanded sharply from £5,388,000 to £6,941,000. After higher depreciation, tax and minority interest charges, the net balance has improved by £570,000 to £2,286,000. Dividend has been effectively stepped up by 4⅞% to the equivalent of 18⅝%. This is covered 2.8 times as forecast at the time of the bid for BOAKE ROBERTS last month.

One million sq. ft. of Swedish Perstorp laminate have been used in the P. and O. Company's new 45,000 ton passenger liner Canberra, due for launching at Belfast next week.

Industry INTELLIGENCE

Technical Data

Polysar Krylene Railpad Compound

A Polysar Krylene railpad compound has been developed for compliance with both the British Railways Provisional Specification for Rubber Railpads (Natural or Synthetic) to suit RNB 6/58 Clip Fastenings, and Specification No. 667F of the French National Railways. Details of the compound and results of physical tests on the vulcanizate, before and after ageing, are given in Polysar Technical Report No. 8:12C, by W. D. Gunter, distributed in the UK by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

The compound contains 30 phr of SRF black and 30 phr of FEF black. An important ingredient is Resin G-12, in a proportion of 5 phr. This is effective in enabling the compound to meet the difficult condition of both specifications that the increase in modulus on ageing must not exceed 40% of the unaged value. Staybelite resin is less effective than G-12 but it will meet this condition of the specification. The compound has a fast, flat cure, and there is no risk of scorching if the accelerators are added on a cold mill.

Vybak DVR.262

Vybak DVR.262 is a rigid PVC sheet material of high impact strength. It contains small quantities of stabilizers, lubricant and pigment, but is free from plasticizers and modifiers. Information on the forms available, physical properties, machining and forming of this material is given in Advance Information Sheet K.16 issued by Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1.

Vybak DVR.262 is a new vacuum forming material which widens the scope for vacuum forming thermoplastic sheet generally. Vacuum forming projects which have been dropped for technical or economic reasons can now be reconsidered in view of the fast cycling deep draw and impact resistance properties of this new material. Vybak DVR.262 is capable of being formed by any of the other well-established methods, namely, drape, air-slip, plunger or plug assisted, pressure moulding and blow moulding. The material has good machining characteristics. Examples of products which may be made with Vybak DVR.262 are refrigerator liners, trays, industrial containers, formed shapes, covers and display articles.

Treatment of Paper with Neoprene Latex

Neoprene Latex Type 400 is a new type of latex which imparts outstanding heat-resistance and ply adhesion to paper. Information on the use of this latex in paper is given in Du Pont Elastomer Chemicals Department Report PR-8, by C. H. Gelbert, available in the UK from the Du Pont Co. (UK) Ltd., 76 Jermyn Street, London, S.W.1.

Neoprene Latex Type 400 may be incorporated in the paper either as a saturant or as a beater additive. The procedure for both methods is described. The latex has the following effects on the paper: increases the dry and wet strength; renders the paper resistant to water, chemicals, oil, heat and flame; and provides dimensional stability, resistance to abrasion, flexibility and folding endurance. Papers treated with Neoprene Latex Type 400 are excellent for insoles and shoe counters, gaskets and pressure-sensitive tape backings, and as a base for abrasives and imitation leather. Data are given for the properties of papers treated with the latex, including results of heat ageing tests.

Nitrile Rubber Compounds to Meet Specification DTD 5509

Compounds based on Polysar Krynac 803, a nitrile rubber, have been developed to meet the requirements of grades A and D of Ministry of Supply Specification DTD 5509. Details of the compounds and results of laboratory tests on the vulcanizates are given in Polysar Technical Report No. 8:12B, distributed in the UK by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

The compound designed to meet the requirements of grade A contains 100 phr of FEF black while that to meet grade D contains 40 phr of FEF black. Compounds to meet grades B and C can be produced by blending, in appropriate proportions, the two compounds given in the report. Data for tests on the vulcanizates include hardness, tensile strength, elongation at break, cold bend and compression set, as well as the effect of immersion in oils and a dry heat test.

Machines, Materials and Equipment

Repairing Conveyor Belts

A simple but comprehensive repair kit has been introduced by Stenor Ltd., Kew Foot Road, Richmond, Surrey, for the maintenance of conveyor belts of natural or synthetic rubber. It incorporates a portable vulcanizer, the use of which ensures that repairs become fully cured sections of the belt, and not mere patches. The equipment can be handled by one man, and will deal with surface damage, or with holes which penetrate the belt. Facilities are also incorporated for repairing damaged edges.

The vulcanizer unit incorporates thermostatically - controlled electric heating, and uses a simple screw for the application of pressure. The unit can also be used to effect a completely vulcanized splice.

Pocket Microscope

Ellis Optical Company, Thornton Heath, have designed and produced a high-powered pocket microscope which has optically - worked lenses, and has a magnifying power of from 20 up to 40 times. It is useful to engineers, textile workers, and all who find it necessary to study their subject in minute detail.

A mirror at the base, when turned towards a light source, reflects light on to the object to be examined. Magnification can be increased by extending the sliding tube and correct focusing is obtained by adjusting a knurled ring. The circle or field is approximately ¼in. Its size is little more than that of the average pen.

New Publications

'Drop-Mats' of Flexible Polyurethane Foam

A recent and most successful application of flexible polyurethane foam is its utilization for 'drop-mats.' These serve as a cushioning layer when drums, kegs, barrels, etc., are unloaded by dropping from a higher to a lower level, as from a lorry to a receiving deck.

For example, for a 45-gallon drum, a block of flexible polyurethane foam based on Daltocel SF and Suprasec SF and measuring 36in. x 22in. x 5in. was found suitable. The block of foam is enclosed in a rope net. This application of polyurethane foam is described in Technical Information—Urethane PC/U.14, issued by the Polymer and Chemicals Service Department, Dyestuffs Division, Imperial Chemical Industries Ltd.

Urethane Literature Series

I.C.I. Dyestuffs Division have also issued No. 4 in their series 'Urethane Chemicals Literature.' This is called 'Polyurethane Rigid Foams from Daltolac 24 and Suprasec D.' A brief introduction gives the fundamental reaction involved, which leads to the detailing of the physical properties of Daltolac 24 and Suprasec D.

The layout of a rigid foam machine is described as well as its operation and the techniques of applying the foam—for the insulation of floor areas and so on.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Midland Section.—Friday March 18 at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.45 p.m. Joint meeting with the Plastics Institute: 'Silicones in the Plastics and Rubber Industries,' by P. A. J. Gate (Midland Silicones).

Scottish Section. — Twenty-sixth annual general meeting to be held at the North British Hotel, 40 George Street, Glasgow, C.2, on Tuesday March 15 1960 at 7.30 p.m., to be followed by 'The Expanding Compass of the Pneumatic Tyre,' by Mr D. Orton (Goodyear Tyre and Rubber Co. (G.B.) Ltd.).

PLASTICS INSTITUTE

London Section.—Tuesday March 15 at the National College of Rubber Technology, Holloway Road, N.7. Brains Trust (Junior Meeting).

Midland Section.—Friday March 18. Joint meeting with the Institution of the Rubber Industry. For details see IRI Midland Section above.

North-Eastern Section.—Wednesday March 16 at the Eldon Grill, Grey Street, Newcastle, at 7 p.m. 'Dough Moulding Compounds,' by J. D. Davies (British Resin Products).

Scottish Section. — Wednesday March 16 at More's Hotel, Glasgow, at 7.30 p.m. 'PTFE,' by G. W. Bowley (I.C.I.).

British Standards

Gas Tubing

Requirements for three types of tubing are specified in this second revision of BS 669, 'Flexible tubing and connector ends for appliances burning town gas.' The types are: flexible non-metallic tubing and connector ends for domestic portable appliances; general purpose flexible metallic tubing for domestic portable appliances; heavy duty armoured flexible tubing and connector ends.

Appendices deal with determination of elongation of rubber thread under constant load; determination of resistance of rubber thread to accelerated ageing; and with details of the flexing test.

The address of the British Standards Institution Sales Branch is 2 Park Street, London, W.1.

Fleck SCI President

The new president of the Society of Chemical Industry for 1960-61 will be Sir Alexander Fleck. He will succeed Monsieur E. J. Solvay in July. Sir Alexander has been a member of the society since 1917, and holds its Messel and Castner medals.

Mr W. A. Bartlett has been appointed an executive director of Microcell.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

POLAPLEX (794,359) Waterproofing preparations (not being paints). M. G. Plastics Ltd., 19 Mincing Lane, Blackburn, Lancashire. (Class 1; January 26 1960).

OMITRON MACHINES

(791,273) Machines for use in the metal-working and plastics industries, but not including folding machines or any goods of the same description as folding machines. Omitron Machines Ltd., 9 Tavistock Terrace, Upper Holloway, London, N.19. (Class 7; January 26 1960).

SPRINGBOK (787,852) Cardboard cartons lined with plastics. Suzanne Marguerite Alexander, trading as S. M. Alexander and Co., 213-215 Upper Street, Islington, London, N.1. (Class 1; January 26 1960).

FABLON TOP (794,133) Adhesive backed sheets of plastics for application to surfaces for protective or decorative purposes. Commercial Plastics Ltd., Willington Quay, Wallsend-on-Tyne, Northumberland. (Class 17; January 26 1960).

FLOTAFOAM (795,039) Furniture upholstered with foamed materials and cushions (upholstery) made from foamed materials. C. T. Wright Ltd., 24 Western Avenue, London, N.W.11. (Class 20; January 26 1960).

MARIGOLD (793,293) Articles of infants' clothing made of rubber or of plastics. J. Allen Rubber Co. Ltd., Whitecroft, Lydney, Gloucestershire. (Class 25; January 26 1960).

CARBITOL (778,299) Esters and ethers, all being chemical products for industrial use; and glycol-ether. Union Carbide Corp. Address for service is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2. (Class 1; February 2 1960).

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on February 27 1960

Badische Anilin- and Soda-Fabrik A.G. Recovery of pure olefin polymers. 828,650.

General Aniline and Film Corp. Film forming solutions of copolymers of N-vinyl pyrrolidone and N-vinyl esters. 828,970.

Hercules Powder Co. Polymerization of ethylenically unsaturated hydrocarbons. 828,973.

Union Carbide Corp. Trimethylophenol-polyol thermosetting copolymers. 828,662.

General Aniline and Film Corp. Reaction products of gamma lactones with polyamines. 828,665.

De Bataafsche Petroleum Maatschappij N.V. Process for stabilizing oil-extended rubber. 828,666.

American Machine and Foundry Co. Method of making polymer films. 828,977.

Union Carbide Corp. Plastic conduit joint. 829,179.

De Bataafsche Petroleum Maatschappij N.V. Polymerization of ascetylenically unsaturated hydrocarbons. 828,989.

Union Carbide Corp. Process for the thermal treatment of polyethylene. 829,065

British Bata Shoe Co. Ltd. Machine for manufacturing shoes and like articles of plastic material. 828,994.

Union Carbide Corp. Process for the production of terpolymers. 828,993.

Soc. Des Usines Chimiques Rhone-poulenc. Production of ethylene polymers. 828,996.

Open to public inspection on March 2 1960

Henleys Telegraph Works Co. Ltd., W. T. and F. T. Griffiths. Point and die assemblies for extrusion of, e.g., plastic or metal sheathing for electrical conductors. 829,185.

Semtex Ltd. Production of thermoplastic sheet material. 829,495.

Petrochemicals Ltd. Define polymerization catalysts and olefine polymerization processes involving same. 829,626.

Telegraph Construction and Maintenance Co. Ltd. Electric cables. 829,189.

Harbens Ltd. Production of filaments, threads, fibres and the like from viscose. 829,499.

Aerotecnica S.A. Rotary-wing aircraft. 829,183.

NEW COMPANIES

Salisbury Tyres and Accessories Ltd. (650,365).—February 24. Capital: £5,000 in £1 shares. The permanent directors are: Reginald B. Living and Angela J. Living, both of "Trees," Whelpley, Whiteparish, Wilts. Regd. office: 91 Crane Street, Salisbury, Wilts.

Ensign Plastics Ltd. (650,177).—February 22. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic goods, etc. The permanent directors are: Alan Banner and Frank Banner, both of 14 New Road, Ermyn Way, Leatherhead. Regd. office. Ermyn Way, Leatherhead.

J. and W. Kavanagh (Tyres) Ltd. (650,261).—February 23. Capital: £100 in £1 shares. The directors are Jack Kavanagh and Ray Kavanagh, both of 34 Knowle Lane, Sheffield 11; Michael Kavanagh, 24 Caroline Terrace, S.W.1. Regd. office: Gibraltar Street, Sheffield.

Tyres and Battery Supplies Ltd. (650,441).—February 24. Capital £100 in £1 shares. The directors are: David T. Mack, 54 Huntly Road, Bournemouth; Alexander McNeill, The Grove, Balcombe Road, Branksome Park, Bournemouth. Regd. office: 850 Wimborne Road, Bournemouth.

Pee Dee Mouldings Ltd. (650,577).—February 25. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in plastic substances, etc. The directors are: Terence J. Brown and Margaret J. Brown, both of 12 Benets Road, Hornchurch, Essex. Regd. office: 156 Front Lane, Cranham, Essex.

Amato Tyre Service Ltd. (650,798).—February 29. Capital: £2,000 in £1 shares. The directors are: Guiseppi L. Amato, 19c Wickham Road, S.E.4; Cyril J. Cox, 35 Frinton Road, S.W.17. Regd. office: 6 Friendly Street, S.E.8.

Increases of Capital

Rootes Plastics Ltd. (465,928), 356 Oxford Avenue, Trading Estate, Slough, Bucks.—Increased by £10,000 in £1 ordinary shares, beyond the registered capital of £2,000.

Perrite Ltd. (245,181), Rubber manufacturers, etc., 1/3 Stanley Street, Liverpool.—Increased by £12,500 in £1 ordinary shares, beyond the registered capital of £37,500.

Wipro Ltd. (formerly Jamaica Agencies (London) Ltd.). (632,793), Plastic domestic product manufacturers, etc., 89 Stoke Newington Church Street, N.16.—Increased by £3,000 in £1 "B" ordinary shares, beyond the registered capital of £4,000.

Durable Plastics Ltd. (514,584), Woodbridge Industrial Estate, Guildford, Surrey.—Increased by £5,000 in £1 shares, beyond the registered capital of £10,000.

Changes of Name

Percival C. Oxborrow Ltd. (287,903), 22 New Road, Southampton.—Name changed to Express Tyre Service (Southampton) Ltd. on October 20, 1959.

Rotaflex (GB) Sheeting Ltd. (572,865), Plastic manufacturers, etc., 4-10 Nile Street, N.1.—Name changed to Rotaflex (Architectural and Display Lighting) Ltd. on October 20 1959.

R.J.I.P. CLASSIFIED ADVERTISEMENTS

Classified Advertisements may be displayed under each heading at £3 per inch, single column. Write or phone for details.

APPOINTMENTS VACANT

RUBBER technologist or chemist required as assistant to Chief Chemist for supervision of laboratory. A practical approach, a knowledge of synthetics and their control and an ability to work with a minimum of supervision are necessary.—Apply Chief Chemist, B.A.L. and Thomas Boorne and Co. Ltd., Oakeywell Street, Dudley, Worcs. (121)

ADHESIVE chemist required for research and development. Previous experience essential including knowledge of synthetic rubber and latices. Rapidly expanding firm, excellent prospects.—Apply in writing to Managing Director, Crispin Chemical Co. Ltd., Coleman Road, Leicester. (129)

A RESEARCH chemist and a production chemist are required for the development and manufacture of polyurethane foams. Some previous knowledge and experience in this field would be preferred but all applications for these two positions will be considered. An attractive salary is offered with a rapidly expanding company. Replies in confidence to:—Aeropreen Products Limited, Lindsay Avenue, High Wycombe, Bucks. (82)

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LABORATORY assistant required for rubber and plastic factory in South-West London district for materials control, testing and development work. Excellent opportunity for ambitious individual. Staff pension scheme.—Write stating age and qualifications to Box 134. (134)

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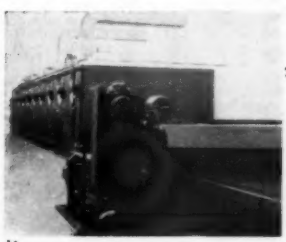
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Rubber Trends
The *March* issue of this quarterly publication for producers, manufacturers and dealers contains the following *special reports*
THE MALAYAN RUBBER INDUSTRY
PRODUCTION AND CONSUMPTION OF SYNTHETIC RUBBER IN WEST EUROPE
THE WORLD BALANCE—a regular feature assessing the outlook for demand and prices
THE
ECONOMIST INTELLIGENCE UNIT LTD.
22 Ryder Street, St. James's, London, S.W.1
Whitehall 0353, Ext. 7

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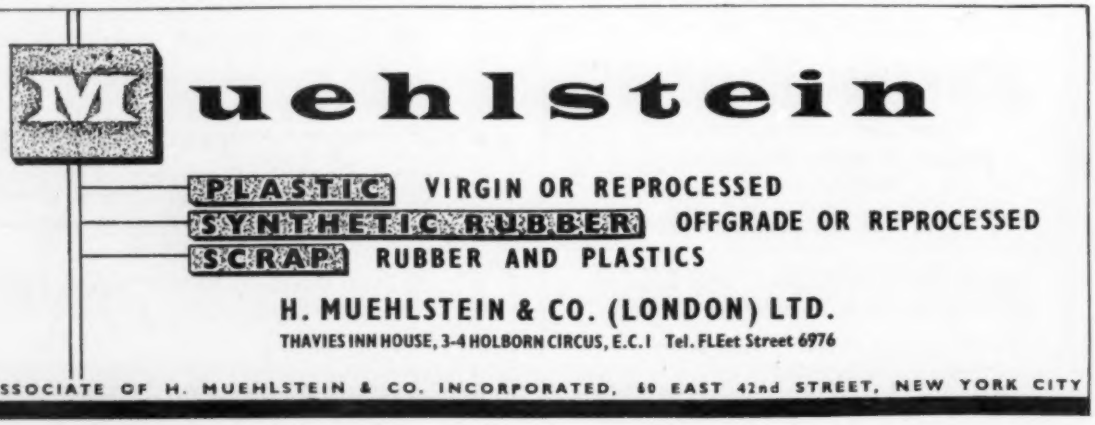
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